

# THE ELECTRENTOMOID PSOCIDS (PSOCOPTERA)<sup>1</sup>

BY EDWARD L. MOCKFORD

Department of Biological Sciences  
Illinois State University, Normal, Illinois

The psocids dealt with in this paper, the electrentomoids, are forms resembling amphientomids but lacking scales or at most having a vestiture of minute scale-like structures on the wings. Universally, the subcosta of the forewing describes an arc and rejoins the radius. There is a tendency, not universal, for the two anal veins of the forewing to join together before reaching the wing margin.

These psocids were first treated taxonomically by Enderlein (1911:337) as the subfamily Electrentominae of Amphientomidae, to accommodate the single genus *Electrentomum*, with a single included species, *E. klebsianum*, from Baltic amber. A second genus, *Parelectrentomum*, with a single species, *P. priscum*, also from Baltic amber, was described by Roesler (1940:228). A third genus, *Manicapsocus*, the first living form assigned to the Electrentominae, was described by Smithers (1965:46) from Angola.

Also included among the electrentomoid psocids are *Compsocus* Banks (1930:183) and *Plaumannia* Roesler (1940:234). Banks placed *Compsocus* in the family Amphientomidae due to the presence of minute scale-like structures forming the vestiture of the surface of the forewing. The wing venation and other characters mark this genus as clearly electrentomoid. Roesler made *Plaumannia* the basis of a new family, Plaumanniidae. I retain this group as one of the electrentomoid families, but give it a new name (Troctopsocidae) because of homonymy of *Plaumannia*.

I have been able to examine specimens of all of the described living species of electrentomoids plus representatives of six new genera and fourteen new species from the American tropics. The new forms are described here and three new families are erected. *Compsocus* and *Troctopsocus* are redescribed; notes on *Manicapsocus* are included, as is a key to the genera. Finally, a preliminary attempt is made to

---

<sup>1</sup>This work has been supported by National Science Foundation grants NSFG-19263, GB-2713, and GB-5163 from September, 1961 to the present. Some equipment used in this project was purchased with grants from Illinois State University (grant numbers 61-15 and 65-24). My field work in South America in 1959 was supported by a travel grant from the American Museum of Natural History, New York City.

*Manuscript received by the editor June 26, 1967.*

assess the phylogeny of the electrentomoids. In the section on phylogeny, I discuss reasons for not regarding the electrentomoids as a single taxon at any level, although I previously considered them to form a single family (Mockford, 1966).

Measurements were taken principally from whole specimens mounted temporarily in glycerine. The degree of precision of the measurements is indicated as follows: for wing measurements the micrometer unit equals  $22.2\mu$ , for tibial measurements the micrometer unit equals  $7.5\mu$ , and for all other measurements the micrometer unit equals  $3.7\mu$ .

Terminology — The term clunium is used for the fused dorsal and lateral sclerotized regions of abdominal segments 8 through (probably) 10. The rounded cushion-like field of the paraproct generally bearing trichobothria is called the paraproctal sensorium. Both of these designations follow Pearman (in litt.). A sclerite of the subgenital plate, generally in the form of a letter T is designated T-shaped sclerite, although it may take other forms. The sac of the spermatheca is divided into two regions, one adjoining the duct, and the other further from the duct. The former is designated basal region, and the latter distal region. The lacinial tip generally has two principal tines, here called median and lateral cusps, indicating the positions which these structures usually hold in relation to the mid-plane of the insect, although the lacinia is capable of a certain amount of rotation. In the bilobed third ovipositor valvula, the larger, more basal lobe is designated primary lobe, and the smaller, more distal lobe is designated secondary lobe.

Acknowledgements. — Mr. Aaron M. Nadler of Brooklyn, N. Y., aided in making travel arrangements for my trip to South America in 1959 and accompanied me in the field on the trip. Mr. C. J. Rosales of the Facultad de Agronomia, Universidad Central de Venezuela, Maracay, provided transportation and guide service, as well as aided with the field work, while we were in Venezuela. Electrentomoids were collected on my trip to the Lesser Antilles and Trinidad in 1961. Mr. John K. Bouseman of the University of Illinois, Urbana, made travel arrangements for that trip and accompanied me on it. Mr. R. Ayliffe, then forestry officer for the British Leeward Islands, provided transportation and served as guide while we were in St. Lucia. The staff of the New York Zoological Society Field Station at Simla provided our living facilities while we were in Trinidad. The discoveries of some of the rare and local Mexican species could not have been made without the help of several Mexican

people. I am especially grateful to Mr. Alejandro Manzano C. of Monterrey, who accompanied me on two collecting trips to southern Mexico, serving as field assistant, interpreter, and liaison with the local people.

Specimens for study were borrowed in part from the Illinois State Natural History Survey, (Urbana), the United States National Museum (Washington, D.C.), and Mr. C. N. Smithers (Australian Museum, Sydney). Dr. Dale E. Birkenholz of Illinois State University collected the unique type of one species in Costa Rica. Dr. W. L. Brown, Jr., of Cornell University (Ithaca, N. Y.) sent the first specimen of the bizarre form *Prothroctopsocus enigmaticus* n. gen., n. sp., which aided considerably in placing this project in proper perspective. Dr. Brown's notes on the collecting site of that species were sufficiently precise so that I was able to go to the spot and collect a series of the species.

The descriptive statistics based on measurements and ratios were run on an IBM 1620 computer. The program was borrowed from Dr. R. B. Selander, University of Illinois, Urbana, and was adapted to our computer by Dr. S. K. Wong, my research associate, and Mr. Brian Crissie of the Illinois State University Computer Center.

To all of the above mentioned individuals and institutions I wish to express my sincere thanks.

#### CLASSIFICATION OF THE ELECTRENTOMOID PSOCOPTERA

The electrentomoids are here arranged in the following families and genera:

Musapsocidae, new family

*Musapsocus*, new genus

Troctopsocidae, new name for Plaumanniidae Roesler

*Prothroctopsocus*, new genus

*Troctopsoculus*, new genus

*Troctopsocopsis*, new genus

*Troctopsocus*, new name for *Plaumannia* Roesler

Manicapsocidae, new family

*Manicapsocus* Smithers

*Epitroctes*, new genus

Compsocidae, new family

*Compsocus* Banks

*Electrentomopsis*, new genus

Genera Incertae Sedis (probably Manicapsocidae or Compsocidae)

*Electrentomum* Enderlein

*Parelectrentomum* Roesler

## ARTIFICIAL KEY TO THE GENERA OF ELECTRENTOMOID PSOCOPTERA

- 1a. Vein M in hindwing simple ..... 3.
- 1b. Vein M in hindwing branched ..... 2.
- 2a. First segment of Rs in hindwing present. Forewing membrane covered with tiny scale-like structures ..... *Compsocus* Banks (*C. elegans* Banks).
- 2b. First segment of Rs in hindwing absent. Micro-vestiture of forewing membrane in form of short points ..... *Electrentomopsis*, n. gen. (*E. variegatus*, n. sp.).
- 3a. Pterostigma closed basally ..... 4.
- 3b. Pterostigma open basally ..... 8.
- 4a. Cubital loop joined to M<sub>3</sub> by a crossvein ..... *Proctropsocus*, n. gen. (*P. enigmaticus*, n. sp.)
- 4b. Cubital loop not joined to M ..... 5.
- 5a. First segment of Rs in hindwing present ..... *Parelectrentomum* Roesler (*P. priscum* Roesler, Oligocene, Baltic amber).
- 5b. First segment of Rs in hindwing absent ..... 6.
- 6a. With 15 antennal segments ..... 7.
- 6b. With 13 antennal segments ..... *Electrentomum* Enderlein (*E. klebsianum* Enderlein, Oligocene, Baltic amber).
- 7a. Vein 2A of forewing not joining 1A; R<sub>1</sub> in forewing widened to form a dark spot in region of its junction with wing margin ..... *Manicapsocus* Smithers (*M. alettae* Smithers, Rhodesia).
- 7b. Vein 2A in forewing joining 1A; R<sub>1</sub> normal ..... *Epi-troctes*, n. gen. (*E. tuxtlarum*, n. sp.).
- 8a. Cubital loop joined to M<sub>3</sub> ..... *Troctopsocus* (new name for *Plaumannia* Roesler).
- 8b. Cubital loop not joined to M<sub>3</sub> ..... 9.
- 9a. Two claws of each pretarsus alike, each with two preapical teeth ..... *Troctopsoculus*, n. gen. (*T. morenus*, n. sp.).
- 9b. Two claws of each pretarsus unlike: anterior claw (of each pretarsus) bearing membranous cowl-like swelling enclosing all but tip of claw shaft ..... 10.
- 10a. Pterostigma broader than preceding cell. Wings unmarked ..... *Musapsocus*, n. gen.
- 10b. Pterostigma narrower than preceding cell. Forewing marked with a vague pattern ..... *Troctopsocopsis*, n. gen.

Family **Musapsocidae**, new family

Diagnosis. — Antennae of 12 segments. Frontal sutures absent. Lacinial tip with three tines composed of the median cusp, the tip of the lateral cusp, and a subapical denticle of the lateral cusp. Tarsi two-segmented. Pretarsal claws of each foot unlike, the anterior claw broadened by a membranous covering or cowl, the posterior claw without a cowl and bearing a preapical denticle. Pterostigma open basally. Vein 2A of forewing joining 1A or ending freely without joining wing margin. First segment of Rs in hindwing absent, but two ends of the vein sometimes present. Third ovipositor valvula not bilobed apically.

Genus **Musapsocus**, new genus

Diagnosis. — With the characters of the family.

Type species: *M. huastecanus*, new species

**Musapsocus huastecanus**, new species

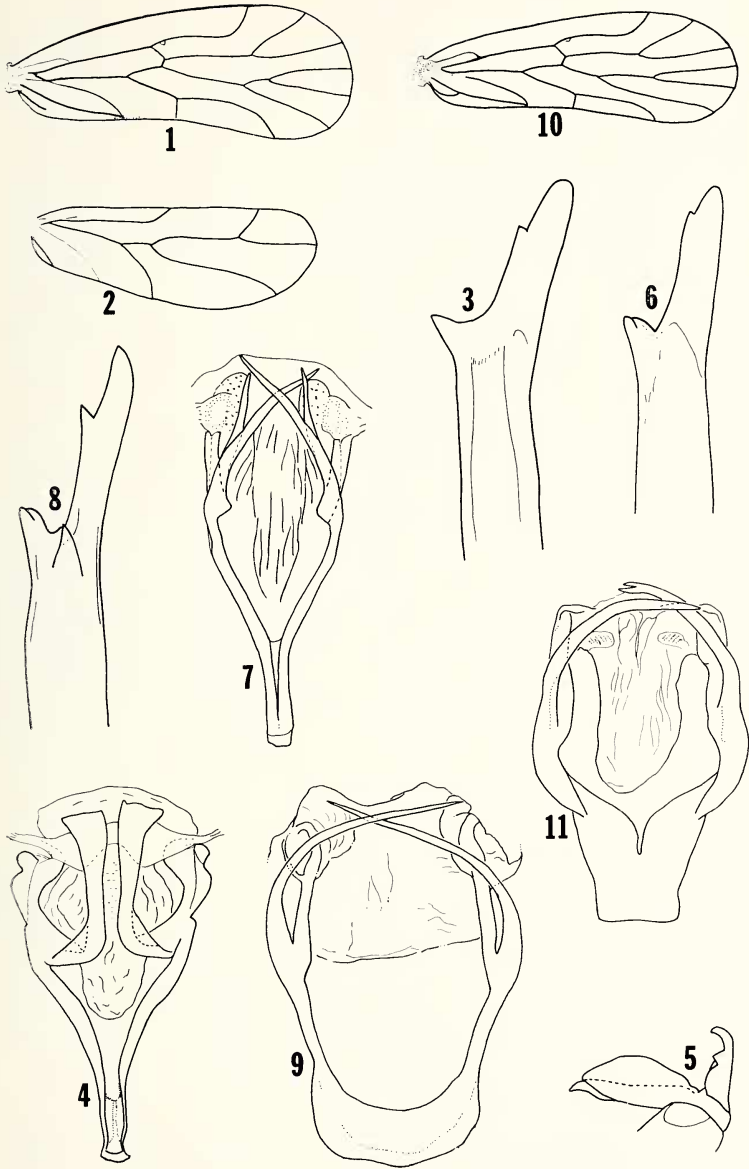
Diagnosis. — Vein 2A in forewing ending freely, joining neither 1A nor wing margin. Male with three pairs of papillar fields on dorsum of clunium, the most posterior pair narrowly separated on midline and reaching posterior clunial margin; small median papillar field present on dorsum of eighth abdominal segment. Male with parameres joined to form slender rod anteriorly. Female with first ovipositor valvula bearing a short rounded lobe on mesal margin near base; third valvula with no indication of bilobing. Female subgenital plate with posterior margin flat; plate lacking T-shaped sclerite.

Male. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 6): median cusp showing line through tip suggesting it to be slightly bifid. Hypandrium with posterior margin thickened and curved. Phallosome (fig. 7): parameres with basal line of fusion extending nearly to extreme base; posterior branching of parameres resulting in (1) pair of short,

## EXPLANATION OF PLATE 17

- Fig. 1. — *Musapsocus creole*, n. sp., ♀, forewing.  
 Fig. 2. — *M. creole*, n. sp., ♀, hindwing.  
 Fig. 3. — *M. creole*, n. sp., ♀, lacinial tip.  
 Fig. 4. — *M. creole*, n. sp., ♂, phallosome.  
 Fig. 5. — *M. creole*, n. sp., ♀, pretarsal claws.  
 Fig. 6. — *M. huastecanus*, n. sp., ♂, lacinial tip.  
 Fig. 7. — *M. huastecanus*, n. sp., ♂, phallosome.  
 Fig. 8. — *M. tabascensis*, n. sp., ♀, lacinial tip.  
 Fig. 9. — *M. tabascensis*, n. sp., ♂, phallosome.  
 Fig. 10. — *M. birkenholzi*, n. sp., ♂, forewing.  
 Fig. 11. — *M. birkenholzi*, n. sp., ♂, phallosome.



MOCKFORD — ELECTRENTOMOID PSOCIDS

straight lateral arms each of which apparently re-divides, the resulting two rods running closely parallel and terminating in sac-like structure; (2) pair of long median arms, each of which re-divides near its base, the median sub-branches of the two sides curving toward midline and crossing near their tips; lateral sub-branches each surrounded nearly to tip by thin-walled sac containing granules. Anterior and posterior margins of clunium thickened. Clunial papillar fields (fig. 12) distributed as follows: two transverse lateral fields at about one-third distance from anterior to posterior margin; two rounded lateral fields at about two-thirds distance from anterior to posterior margin; a transverse field along posterior margin with slight median interruption. A small papillar field on pre-clunial tergum. Paraproctal sensorium with 9-10 trichobothria and 1-2 setae without basal rosettes.

Color (in alcohol). — Body and appendages largely dull ivory yellow. Compound eyes black. Reddish brown pigment distributed as follows: inner rims of lateral ocelli and upper rim of median ocellus, a small circle antero-ventral to each antennal base, a spot between compound eye and antennal base, a line along suture between ante- and post-clypeus but absent from broad central region, an irregular spot above each subgenal suture, a broad band along each side of thorax, an arc around pleural border of each coxa, an irregular band along each side of abdomen from base to clunium, the bands of the two sides connected by transverse dorsal bands in segments 3, 4, and 5, and by broken transverse bands in segments 6 and 7; papillar fields of clunium, posterior edge of epiproct, and ventral edges of paraprocts with same pigmentation.

Female. — Measurements (Table I).

Morphology. — Subgenital plate (fig. 14) with posterior margin approximately straight and beset with 11-12 strong setae. T-shaped sclerite and interior plate absent. Ovipositor valvulae (fig. 13): first valvula with broad, rounded basal appendage; third valvula very slightly bilobed apically. Paraproctal sensorium with 8-10 long trichobothria and 2 long setae lacking or with weakly developed basal rosettes.

Color (in alcohol). — Same as in male.

Type locality. — La Union near Villa Juarez, Puebla, Mexico, November 3, 1963, E. L. Mockford collector. Holotype ♂, allotype ♀, 11 ♂ and 12 ♀ paratypes and 7 nymphs. Types are for the present in the author's collection.

Records. — Mexico: Veracruz: about 10 miles east of Orizaba on Highway 150.

Habitat. — At both localities, this species was found in dried banana leaves hanging from the tree.

### **Musapsocus creole**, new species

Diagnosis. — Vein 2A in forewing ending freely, joining neither 1A nor wing margin. Male with continuous band of papillae across dorsum of clunium. Male with parameres joined anteriorly to form short slender rod. Female third ovipositor valvula with slight indication of bilobing at apex. Female subgenital plate with posterior margin in form of flat arc; plate bearing small T-shaped sclerite without arms.

Male. — Measurements (Table I).

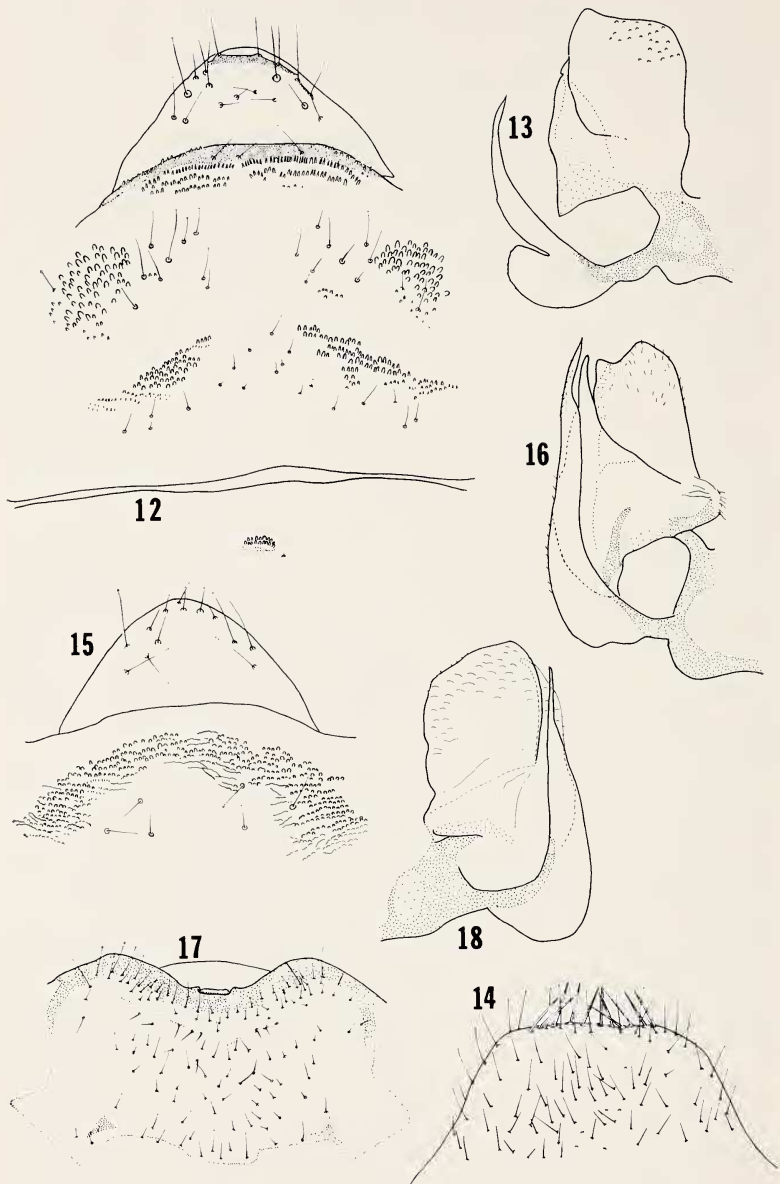
Morphology. — Lacinial tip (fig. 3) with median cusp simple. Hypandrium with posterior margin thickened and slightly bilobed. Phallosome (fig. 4): parameres showing basal line of fusion; posterior branching of parameres resulting in pair of converging arms curving posteriorly before meeting and having broad, truncated ends with tiny denticles on lateral margins; lateral branches of parameres curved out then in, apparently rebranching near tips. Clunium dorsally with transverse field of small denticles in anterior half, and transverse region of larger denticles (fig. 15) in posterior half. Paraproctal sensorium with 10 trichobothria and 3 setae without basal rosettes.

Color (in alcohol). — Body and appendages generally dull ivory yellow. Compound eyes black. Reddish brown pigment distributed as follows: a small circle ventro-mesal to each antennal base; diffuse granules above subgenal suture and concentrated around anterior mandibular articulation, a lateral stripe running entire length of thorax, a band across anterior border of mesonotal lobes, irregular lateral blotches on base of abdomen, a band across abdominal dorsum in region of fourth segment, a spot around each antero-lateral angle of clunium, granules irregularly distributed in epiproct and paraprocts.

Female. — Measurements (Table I).

Morphology. — Subgenital plate (fig. 22) with posterior margin slightly curved and beset with 9 stout setae. T-shaped sclerite present in form of rod with slightly thickened base. Partially cleft interior plate clearly seen through subgenital plate in preparation. Ovipositor valvulae (fig. 16): first valvula lacking basal appendage; third valvula slightly bilobed at apex. Spermatheca with sac dis-





MOCKFORD — ELECTRENTOMOID PSOCIDS

tinctly constricted in middle forming two regions. Paraproctal sensorium with 8-9 long setae.

Color (in alcohol). — Same as in male.

Variation. — One individual was found with ocelli narrowly rimmed with reddish brown — the laterals on mesal margins, and the median on dorsal margin.

Type locality. — Rancho Grande National Park, Venezuela (elevation 1100 m.), March 5-8, 1959, E. L. Mockford and C. J. Rosales collectors. Holotype, ♂, allotype ♀, 7 ♂ and 10 ♀ paratypes and 2 nymphs. The holotype, allotype, and some paratypes will be deposited in the American Museum of Natural History (New York City); remaining paratypes will be retained in the author's collection.

Habitat. — This insect was taken from dried leaves of *Heliconia* in upland rain forest.

#### ***Musapsocus tabascensis*, new species**

Diagnosis. — Vein 2A in forewing generally joining 1A, at least on one side. Male with pair of papillar fields dorsally on clunium, widely separated and bordering posterior clunial margin. Phallosome with broad, rounded base. Female subgenital plate with posterior margin vaguely trilobed; plate bearing T-shaped sclerite with short arms. Third ovipositor valvula with no trace of bilobing.

Male. — Measurements (Table I).

Morphology. — Hypandrium with posterior margin thickened and bilobed; short central region reinforced by a ridge. Phallosome (fig. 9) with base broad and rounded; posterior branching of parameres resulting in median pair of straight rods, each ending in sac-like region, and lateral pair of rods curved out then toward midline and crossing before their apices. Clunium with anterior and posterior margins thickened; two lateral papillar fields (fig. 23) bordering posterior margin. Paraproctal sensorium with 9 true trichobothria and a seta without basal rosette.

Color (in alcohol). — Body and legs generally dull ivory; head with slight grayish brown wash. Antennae medium brown. Com-

---

#### EXPLANATION OF PLATE 18

Fig. 12. — *Musapsocus huastecanus*, n. sp., ♂, clunial dorsum and epiproct.

Fig. 13. — *M. huastecanus*, n. sp., ♀, ovipositor valvulae.

Fig. 14. — *M. huastecanus*, n. sp., ♀, subgenital plate.

Fig. 15. — *M. creole*, n. sp., ♂, clunial dorsum and epiproct.

Fig. 16. — *M. creole*, n. sp., ♀, ovipositor valvulae.

Fig. 17. — *M. tabascensis*, n. sp., ♂, hypandrium.

Fig. 18. — *M. tabascensis*, n. sp., ♀, ovipositor valvulae.

pound eyes black. Reddish brown pigment distributed as follows: median rims of lateral ocelli and dorsal rim of median ocellus, discontinuously along suture between post- and ante-clypeus, faint irregular band along each side of thorax, pleuro-coxal border of metathorax and epimero-coxal borders of pro- and mesothoraces; narrow band across base of abdomen dorsally; complete bands across abdominal terga 3 and 4 and a pair of lateral spots in each of terga 2, 5, 6, and 7; postero-lateral borders of epiproct. Clunium pale grayish brown.

Female. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 8): apex of lateral cusp pointed; median cusp slightly bifid at apex. Subgenital plate (fig. 25) with posterior margin faintly trilobed, beset with 12 strong setae; T-shaped sclerite present as a rod; small pigmented region interiorly near base of plate. Ovipositor valvulae (fig. 18): first valvula lacking basal appendage; third valvula with no trace of bilobing. Spermatheca (fig. 24): sac with constriction in about middle. Paraproctal sensorium with 10-11 typical trichobothria and one seta with poorly developed basal rosette.

Color (in alcohol). — Same as in male.

Type locality. — Palenque Ruins, Chiapas, Mexico, July 5, 1966, E. L. Mockford collector. Holotype ♂, allotype ♀, 1 ♂ and 1 ♀ paratypes. Types are in the author's collection.

Records. — Mexico: Chiapas: Finca Monte Libano in Ocosingo Valley. Tabasco: 6 miles west of Macuspana.

Habitat. — Specimens from the type locality were beaten from dried *Heliconia* leaves. The single specimen from the Tabasco locality was beaten from palm foliage.

### **Musapsocus birkenholzi**, new species (♂)

Diagnosis. — Both forewings of single specimen with 2A joining 1A, but in right wing 2A forking just before junction, sending short vein almost to wing margin. Male with four papillar fields dorsally on clunium: one on midline at posterior margin, one on midline about half distance from anterior to posterior margin, and a pair very widely separated near anterior margin. Parameres joined anteriorly to form broad basal region of phallosome.

Male. — Measurements (Table I).

Morphology. — Hypandrium with posterior margin thickened and deeply bilobed, apparently reinforced in middle by short ridge. Phallosome (fig. 11): parameres broadened toward base with broad

fused region showing partial fusion line; posterior branching of parameres resulting in pair of median, straight arms each terminating in sac-like region and pair of lateral arms strongly curving out then toward midline where tips cross; each arm bifid near its tip. Clunium (fig. 19) with margins only slightly and irregularly thickened; two lateral fields of small papillae near anterior clunial margin; compact, round field of large papillae in middle, and compact field on posterior margin along midline. Paraproctal sensorium with 6-7 trichobothria and one seta without basal rosette located centrally in field.

Color (in alcohol). — Head and antennae straw brown; thorax and legs dull ivory yellow; abdomen dull white except clunium straw brown. Compound eyes black. Reddish brown pigment distributed as follows: median rims of lateral ocelli and dorsal rim of median ocellus, irregular pale blotches on sides of thorax, a transverse band on each of preclunial terga 2 to 7.

Type locality. — Cartago, 5 Km. southeast of Turialba, Costa Rica, August 24, 1963, D. E. Birkenholz collector. Holotype ♂. The type is in the author's collection.

#### **Musapsocus simlae**, new species (♀)

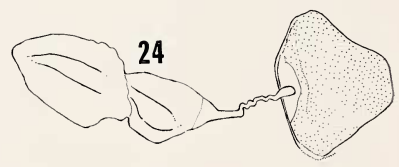
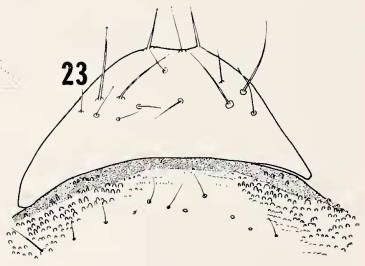
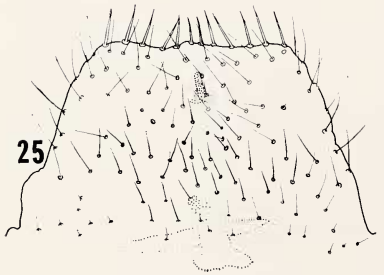
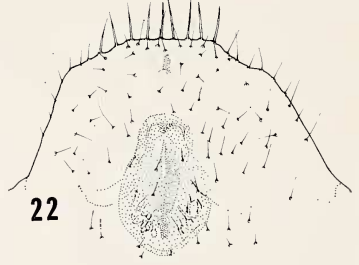
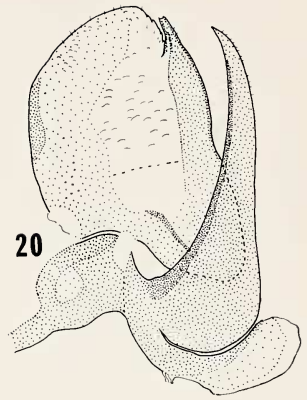
Diagnosis. — Both forewings of single specimen with 2A joining 1A. First ovipositor valvula bearing a rounded appendage at its base; third valvula with no trace of bilobing. Subgenital plate lacking T-shaped sclerite.

Female. — Measurements (Table 1).

Morphology. — Subgenital plate (fig. 21) with posterior margin deeply bilobed, bearing 13 strong setae; cleft interior plate present. Ovipositor valvulae (fig. 20): first valvula with basal appendages abutting on sclerite of spermathecal opening; second and third valvulae clearly fused for most of their length; third valvula rounded apically. Paraproctal sensorium with 10 trichobothria and a seta without basal rosette.

Color (in alcohol). — Head, thorax, and appendages generally dull ivory yellow. Abdomen dull white. Compound eyes black. Reddish brown pigment distributed as follows: scattered granules on genae and thoracic pleura, a diffuse spot on each side of each preclunial abdominal segment, a narrow band dorsally across base of abdomen, a broad diffuse band across fourth abdominal tergum.

Type locality. — Simla near Arima, Trinidad, W.I., August 30, 1961, E. L. Mockford collector. Holotype ♀. The type is in the author's collection.



MOCKFORD — ELECTRENTOMOID PSOCIDS

Habitat. — The single specimen was beaten from dried leaves of *Heliconia* in upland rain forest.

Family **Troctopsocidae**, new name

Plaumanniidae Roesler, 1940, *nec* Lundblad, 1936.

Diagnosis. — Antennae of 11, 13, or 15 segments. Frontal sutures absent. Lacinial tip with medium cusp divided, lateral cusp with two or more prominent preapical denticles. Tarsi three-segmented. Pterostigma open or closed basally. Vein 2A in forewing running from its origin a short distance along wing margin, then joining 1A. First segment of Rs in hindwing present or absent. Third ovipositor valvula bilobed apically.

Genus **Protoctopsocus**, new genus

Diagnosis. — Antennae of 15 segments. Pterostigma closed basally. First segment of Rs present in hindwing. Adults (♀) occurring in macropterous and 'brachypterous' forms, the latter with forewings not much shortened, but elytriform. Macropterous form with ocelli normal, these poorly developed in brachypterous form. Frons longer than postclypeus in anterior view. Pretarsal claw with 2 preapical teeth. Terminal segment of maxillary palpus slightly swollen near tip (fig. 46).

Type species. — *P. enigmaticus*, new species.

**Protoctopsocus enigmaticus**, new species (♀)

Macropterous Female. — Measurements (Table I).

Morphology. — Tip of galea sculptured with reticulate pattern apparently formed by end views of closely packed column-shaped structures. Lacinial tip (fig. 28) with median cusp bidentulate, having a small inner denticle and larger outer denticle; lateral cusp with apex apparently undivided; 3 denticles before apex, 2 more basal ones arising about at same level, much smaller than more distal one. Row of 7 spines on anterior carina of first femur. Subgenital plate (fig. 37) with apex thickened, this portion bearing 4 stout

EXPLANATION OF PLATE 19

- Fig. 19. — *Musapsocus birkenholzi*, n. sp., ♂, clunial dorsum and epiproct.  
 Fig. 20. — *M. simlae*, n. sp., ♀, ovipositor valvulae.  
 Fig. 21. — *M. simlae*, n. sp., ♀, subgenital plate.  
 Fig. 22. — *M. creole*, n. sp., ♀, subgenital plate.  
 Fig. 23. — *M. tabascensis*, n. sp., ♂, clunial dorsum and epiproct.  
 Fig. 24. — *M. tabascensis*, n. sp., ♀, spermatheca.  
 Fig. 25. — *M. tabascensis*, n. sp., ♀, subgenital plate.

setae. Ovipositor valvulae (fig. 31): second valvula (not first) intimately associated at base with sclerite of spermathecal orifice; third valvula with secondary lobe very large, exceeding tip of primary lobe. Spermathecal sac with distal region larger than basal region; the duct not coiled (fig. 30). Paraproctal sensorium bearing 5 setae with poorly developed basal rosettes and 2 without basal rosettes.

Color (in alcohol).—Head pale straw brown marked with somewhat darker brown as follows: central and two lateral bands through vertex converging above ocelli; group of spots bordering compound eye mesally, largest extending almost to lateral ocellus; pair of dark reddish brown spots below ocelli; 2 or 3 dark reddish brown spots on each gena below compound eye; epistomal suture brown-bordered; postclypeus mottled with brown antero-medially. Antennae medium brown. Compound eyes black. Thorax and legs generally medium brown, the terga mottled with paler brown. Abdomen with sclerotized band of medium brown surrounding base except for two lateral breaks; remainder pale gray dorsally in preclunial segments, colorless in cuticle ventrally. Subgenital plate, clunium, epiproct, and paraproct medium brown. Forewing (fig. 26) marked with band along margin from cell  $R_5$  through distal end of areola postica, the band including three rounded colorless spots bordering margin, one in each median cell; this band continuous with transverse one from distal end of areola postica anteriorly through distal end of pterostigma; another transverse band from fork of radial stem through nodulus; a brown spot at end of vein  $R_{2+3}$ , another at end of vein  $R_{4+5}$ , another bordering vein  $Cu_{1a}$ , another bordering vein  $2A$  at base; remainder of wing colorless. Hindwing colorless.

Brachypterous Female.—Measurements (Table I).

Morphology.—Differing from macropterous form chiefly as mentioned in generic description. Heavy veins of forewing marking out depressed cells. Hindwings very short, in length equalling about width of thorax, held away from body, their tips nearly contacting inner surfaces of forewings; their venation greatly reduced.

Color (in alcohol).—Essentially same as in macropterous form.

Type locality.—Cuesta de Chipinque near Monterrey, N.L., Mexico, (elevation about 1360 m), July 16-18, 1965, collected by Cornell University Mexico Field Party. Same locality, December 28, 1965 and June 11, 1966, E. L. Mockford collector. Holotype macropterous ♀, 2 macropterous ♀ paratypes, 22 brachypterous ♀ paratypes, and 9 nymphs. The types are at present in the author's collection.

Habitat. — This species occurs in dried leaf litter in the mouths of small caves and other sheltered depressions.

Genus **Troctopsoculus**, new genus

Diagnosis. — Antennae of 11 segments. Pterostigma open basally. First segment of Rs in hindwing absent. Frontal sutures present but faint. Frons longer than postclypeus in anterior view of head. Pre-tarsal claw with 2 preapical teeth. Terminal segment of maxillary palpus shaped as in fig. 47.

Type species. — *T. morenus*, new species.

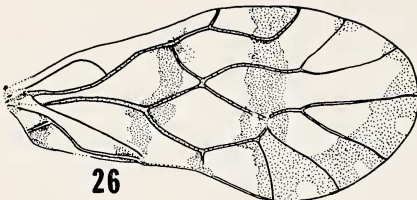
**Troctopsoculus morenus**, new species (♀)

Female. — Measurements (Table I).

Morphology. — Sculpture of integument over entire frontal aspect of head: rough points densely set. Lacinial tip (fig. 35a) with median cusp bidenticulate; lateral cusp with tip divided, 2 denticles arising at about same level below tip; a low, rounded denticle arising at base of lateral cusp. Tips of galeae sculptured with reticulate pattern. Subgenital plate (fig. 38) rounded posteriorly, without stout marginal setae; stem of T-shaped sclerite with pair of lateral projections near its base. Ovipositor valvulae (fig. 35) with close connection between shafts of first and second valvulae and sclerite of spermathecal orifice; third valvula only shallowly bilobed at apex. Spermatheca with wide, curved duct; region of its orifice staining deeply in preparation; sclerite of spermathecal orifice with peripheral ring. Paraproctal sensorium with 7-8 trichobothria and 2-3 setae without basal rosettes.

Color (in alcohol). — Generally dusky brown. Vertex marked with five longitudinal lines of dark brown on paler brown background. Compound eyes dark gray. Frons dusky brown with darker longitudinal line through middle and darker mottling anteriorly. Clypeus, labrum, thoracic sclerites and legs dusky brown. Abdomen ventrally dusky brown with admixture of red except on subgenital plate. Abdomen dorsally mottled with dusky purple on background of pale underlying tissues, except clunium and telson lobes dusky brown. Forewings (fig. 33) dusky brown with irregularly-outlined clear band running diagonally across from region including vein  $R_{2+3}$  to region including base of areola postica. Pterostigma with clear spot in its middle. Each of cells  $R_5$ ,  $M_1$ ,  $M_2$ ,  $M_3$ , and  $Cu_{1a}$  with clear spot bordering margin, in middle of cell except in  $Cu_{1a}$  where more distally placed. Cell  $Cu_2$  clear except for two

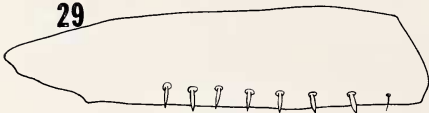




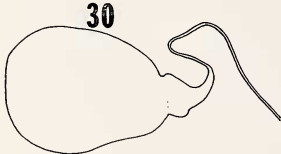
26



27



29



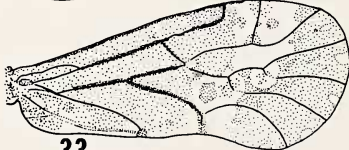
30



32



36



33



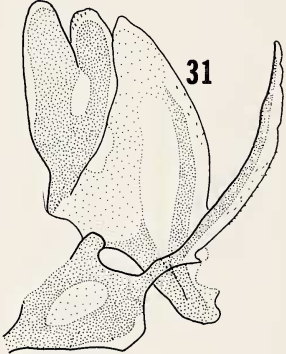
34



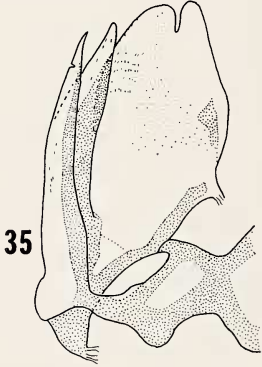
28



35a



31



35

brown spots near base and near apex. Cell 1A partially clear; cell 2A with brown basal spot but mostly clear. Hindwing with costal cell mostly cloudy brown; cloudy brown mark around apex of vein  $R_4 + 5$ , extending down to M and faintly beyond; faint cloudy brown wash in bases of cubital and anal cells; remainder of membrane clear.

Type locality. — 6 miles west of Macuspana, Tabasco, Mexico, April 3, 1964, E. L. Mockford collector. Holotype ♀ and 4 nymphs. The type is in the author's collection.

Habitat. — The specimens were beaten from low foliage of broad-leaved trees and shrubs in lowland rain forest.

### Genus *Troctopsocopsis*, new genus

Diagnosis.—Antennae of 13 segments. Pterostigma open basally. First segment of Rs in hindwing present. Frontal sutures absent. Frons longer than postclypeus in anterior view of head. Anterior claw of each pretarsus untoothed and bearing a cowl covered with setae; posterior claw without cowl, untoothed, and bearing a long basal seta bent at its apex. Terminal segment of maxillary palpus shaped as in figure 48. Subgenital plate (fig. 54) with posterior margin rounded, bearing 4 stout setae in middle; plate lacking T-shaped sclerite. Phallosome a simple Y-shaped structure (fig. 44). Clunium bearing a posterior comb.

Type species. — *T. martinicus*, new species.

### *Troctopsocopsis martinicus*, new species

Diagnosis.—Abdomen reddish brown dorsally on pre-clunial segments, darkest anteriorly and fading posteriorly; ventral surface colorless except for scattered reddish brown pigment at extreme base. Male with uninterrupted comb of posterior clunial margin

#### EXPLANATION OF PLATE 20

- Fig. 26. — *Protoctopsocus enigmaticus*, n. sp., ♀, forewing.  
 Fig. 27. — *P. enigmaticus*, n. sp., ♀, hindwing.  
 Fig. 28. — *P. enigmaticus*, n. sp., ♀, lacinial tip.  
 Fig. 29. — *P. enigmaticus*, n. sp., ♀, anterior femur,  
 Fig. 30. — *P. enigmaticus*, n. sp., ♀, spermatheca.  
 Fig. 31. — *P. enigmaticus*, n. sp., ♀, ovipositor valvulae.  
 Fig. 32. — *P. enigmaticus*, n. sp., ♀, pretarsal claw.  
 Fig. 33. — *Troctopsoculus morenus*, n. sp., ♀, forewing.  
 Fig. 34. — *T. morenus*, n. sp., ♀, hindwing.  
 Fig. 35. — *T. morenus*, n. sp., ♀, ovipositor valvulae.  
 Fig. 35A. — *T. morenus*, n. sp., ♀, lacinial claw.  
 Fig. 36. — *T. morenus*, n. sp., ♀, pretarsal claw.

bearing several short lateral teeth. Sclerite of spermathecal opening with complete peripheral ring.

Male. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 53): two denticles arising toward tip of lateral cusp, both appressed to cusp; a rounded denticle on base of lateral cusp. Hypandrium with distal margin curved, slightly depressed in middle. Phallosome typical of the genus. Clunial comb (fig. 41) as described in diagnosis. Paraproctal sensorium with field of 7 trichobothria and 2 setae without basal rosettes.

Color (in alcohol). — Except for abdomen, almost exactly as described for *T. intermedius*, the chief differences as follows: brown border of epicranial suture not continuing beyond suture; brown regions bordering compound eyes on median sides very pale; medium brown spot or pair of spots below ocelli; epistomal suture bordered in reddish brown; brown lateral band of thorax extending through metathorax, almost completely reddish brown in prothorax and with much reddish brown in metathorax. Wing markings same as described for *T. intermedius*.

Female. — Measurements (Table I).

Morphology. — Subgenital plate typical of the genus. Ovipositor valvulae as described and figured for *T. luciensis*. Sclerite of spermathecal opening (fig. 52) as described in diagnosis. Paraproctal sensorium as in male.

Color (in alcohol). — Same as in male.

Type locality. — Ajoupa-Bouillon, Martinique, F.W.I., August 21, 1961, E. L. Mockford collector. Holotype ♂, allotype ♀, 28 ♂ and 13 ♀ paratypes and 13 nymphs. Types are for the present in the author's collection.

Habitat. — The type series was taken from dead fern leaves on the edge of a road-cut in an upland situation.

### **Troctopsocopsis intermedius**, new species

Diagnosis. — Entire anterior half of abdomen reddish brown, the pigment extending further posteriorly in dorsal than in ventral region. Male with comb of posterior clunial margin interrupted in middle. Sclerite of spermathecal opening with incomplete peripheral ring.

Male. — Measurements (Table I).

Morphology. — Lacinial tip: lateral cusp with one denticle arising abruptly from cusp, another appressed to cusp; a third, rounded denticle at base of cusp. Hypandrium with distal margin curved, slightly depressed in middle. Phallosome typical of the genus.

Clunial comb (fig. 42) as described in diagnosis. Paraproctal sensorium with 7 trichobothria and a seta without basal rosette.

Color (in alcohol). — Head, thorax, and legs largely dull yellowish ivory with darker markings as follows: a medium brown stripe bordering epicranial suture and continuing through frons and postclypeus; a medium brown median border of each compound eye; a reddish brown stripe from lateral edge of postclypeus, through antennal base to compound eye; median mesonotal lobe with medium brown band along mid-line; lateral mesonotal lobes medium brown except along mid-line and along anterior border; medium brown lateral band on pro- and mesopleuron, reddish brown at sutures. Antennae medium brown. Compound eyes black. Abdomen as described in diagnosis. Forewing generally pale brown with colorless spot including stigmasac and another including r-m crossvein. Each longitudinal vein ending in darker spot bordering wing margin except  $R_1$ . Vein M-Cu and  $Cu_1$  darker brown than surrounding membrane and darkly bordered, likewise vein R from Sc junction to radial fork and short distance along branches of fork, also  $R_1$  darkened for short distance beyond stigmasac. Anal cells darker than surrounding membrane. Hindwing generally pale brown, palest throughout cells  $R_1$  and  $R_3$  and along posterior wing margin in cell M.

Female. — Measurements (Table I).

Morphology. — Subgenital plate typical of the genus. Ovipositor valvulae as described and figured for *T. luciensis*. Sclerite of spermathecal opening (fig. 55) as described in diagnosis. Paraproctal sensorium essentially same as in male.

Color (in alcohol). — Same as in male.

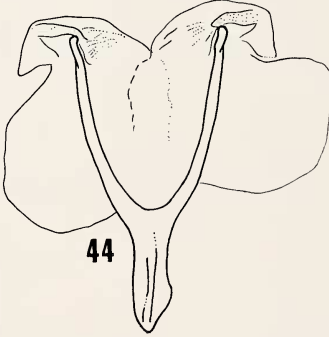
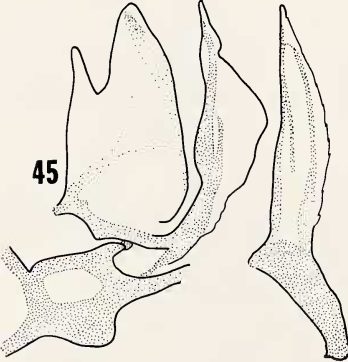
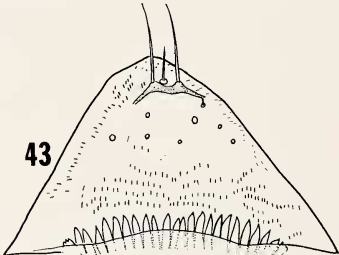
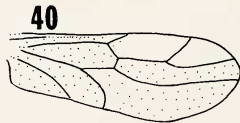
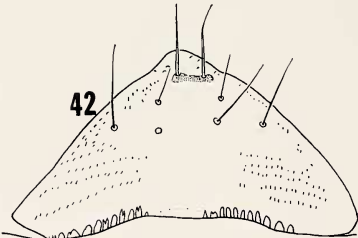
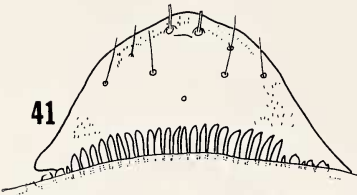
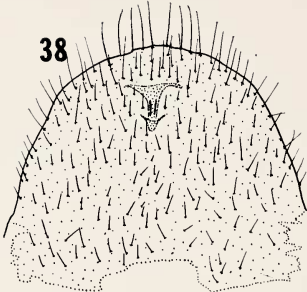
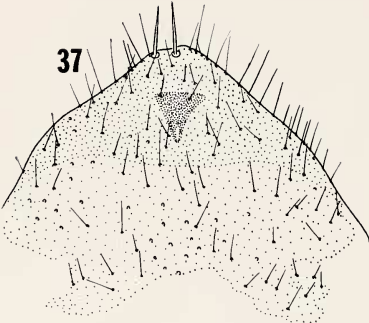
Type locality. — New Power Plant, 5 miles north of Roseau, Dominica, W.I., August 17, 1961, E. L. Mockford collector. Holotype ♂, allotype ♀, and 1 ♂ paratype. The types are in the author's collection.

Records. — Dominica: Portsmouth.

Habitat. — One of the specimens from the type locality was beaten from club moss. The habitat was not noted for the others.

### **Troctopsocopsis luciensis**, new species

Diagnosis. — Abdomen free of reddish brown pigment except for small mark on each side at base. Male with uninterrupted comb of posterior clunial margin composed almost entirely of long teeth, only one or two lateral teeth being short. Sclerite of spermathecal opening



MOCKFORD — ELECTRENTOMOID PSOCIDS

with complete, wide peripheral ring.

Male. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 57): lateral cusp with two denticles set at decided angles to cusp; bluntly pointed denticle at base of cusp. Hypandrium with distal margin approximately straight. Phallosome typical of the genus. Clunial comb (fig. 43) as described in diagnosis. Paraproctal sensorium with field of 6-8 trichobothria and 1-2 setae without basal rosettes.

Color (in alcohol). — Except for abdomen, almost exactly as in *T. martinicus*, the chief differences as follows: a distinct brown spot antero-mesad to each compound eye; pair of spots below ocelli distinctly separate; lateral thoracic stripe generally with less reddish brown, especially paler on prothorax. Wing markings same as in *T. intermedius*.

Female. — Measurements (Table I).

Morphology. — Subgenital plate typical of the genus. Ovipositor valvulae (fig. 45) with first valvula bearing anterior process from base of shaft, this process in contact with sclerite of spermathecal opening. Sclerite of spermathecal opening (fig. 56) as described in diagnosis. Paraproctal sensorium same as in male.

Color (in alcohol). — Same as in male.

Type locality. — Savanne Edmund, St. Lucia, W.I. (elevation approximately 600 m.), August 23, 1961, E. L. Mockford collector. Holotype ♂, allotype ♀, 8 ♂ and 9 ♀ paratypes and 8 nymphs. The types are for the present in the author's collection.

Habitat. — The type series was beaten from dead fern leaves on the edge of a road bordering a forested region.

### Genus *Troctopsocus*, new name

*Plaumannia* Roesler, 1940, Zool. Anz. 129:236, *nec* Lundblad, 1936, Zool. Anz. 115:30.

Diagnosis. — Antennae of 13 segments. Pterostigma open basally. First segment of Rs in hindwing present. Frons longer than post-

---

#### EXPLANATION OF PLATE 21

- Fig. 37. — *Protroctopsocus enigmaticus*, n. sp., ♀, subgenital plate.  
 Fig. 38. — *Troctopsoculus morenus*, n. sp., ♀, subgenital plate.  
 Fig. 39. — *Troctopsocopsis martinicus*, n. sp., ♀, forewing.  
 Fig. 40. — *T. martinicus*, n. sp., ♀, hindwing.  
 Fig. 41. — *T. martinicus*, n. sp., ♂, epiproct and clunial comb.  
 Fig. 42. — *T. intermedius*, n. sp., ♂, epiproct and clunial comb.  
 Fig. 43. — *T. luciensis*, n. sp., ♂, epiproct and clunial comb.  
 Fig. 44. — *T. luciensis*, n. sp., ♂, phallosome.  
 Fig. 45. — *T. luciensis*, n. sp., ♀, ovipositor valvulae.

clypeus in anterior view of head. Pretarsal claws as in *Troctopsocopsis*. Terminal segment of maxillary palpus elongate, rounded apically (fig. 49). M-cu crossvein present in forewing. Subgenital plate with posterior margin tapering, bearing 4 stout setae in middle; with T-shaped sclerite. Phallosome a simple Y-shaped structure.

Type species. — *Plaumannia separata* Roesler.

*Troctopsocus separatus* (Roesler)

*Plaumannia separata* Roesler, 1940, Zool. Anz. 129:236-237, figs. 15-20.

(Note: Specimens from Trinidad, W.I., described below, are assumed to be this species. They agree essentially with Roesler's figures of wing markings, and they agree as closely as is likely with Roesler's figures of lacinial tip and ovipositor valvulae. They average generally slightly smaller than Roesler's Brazilian specimens).

Diagnosis. — Wing markings essentially as illustrated by Roesler (1940: 236, fig. 15). Spermathecal sac with short, slender basal region and a constriction between this region and wide distal region. Ovipositor valvulae: basal arms of first and second valvulae much longer than in *T. similis*, n. sp.; secondary lobe of third valvula only slightly spinose.

Male: Measurements (Table I).

Morphology. — Hypandrium with posterior margin gently curved. Phallosome typical of the genus (as in fig. 63). Posterior margin of clunium bordering epiproct slightly thickened and with slightly scalloped edge, interrupted by smooth edge in middle. Epiproct with postero-mesal field of tiny papillae. Paraproctal sensorium with 7 trichobothria and 2 setae without basal rosettes.

Color (in alcohol). — Differing from Roesler's description only as follows: stripe from eye to mandibular base reddish brown; in addition to central spot from ocelli to clypeus, each lateral edge of frons with a (pale brown) spot; vertex with longitudinal brown stripe immediately to each side of midline, but pale on midline. Reddish brown spots on abdomen distributed as a latero-ventral series on each side (one spot per series per segment) including segments 1 to 4; ventral transverse bands connecting the spots in segments 1 and 2; small spot surrounding each spiracle in segments bearing spiracles.

Female: Measurements (Table I).

Morphology. — Lacinial tip (fig. 68) with lateral cusp bearing two appressed denticles. Subgenital plate with apex less tapering than in *T. similis* and *T. bicolor*. Ovipositor valvulae (fig. 59) as de-

scribed in diagnosis. Paraproctal sensorium with 7 trichobothria and 2 setae without basal rosettes or with these poorly developed.

Color (in alcohol). — Same as in male.

Type locality. — Nova Teutonia, Santa Catharina, Brazil.

Records. — St. Pat's, Arima Valley, Trinidad, W.I.

Habitat. — Some of the specimens from the type locality were reported as taken on bark. The Trinidad specimens were beaten from dried fern leaves.

### **Troctopsocus similis**, new species(♀)

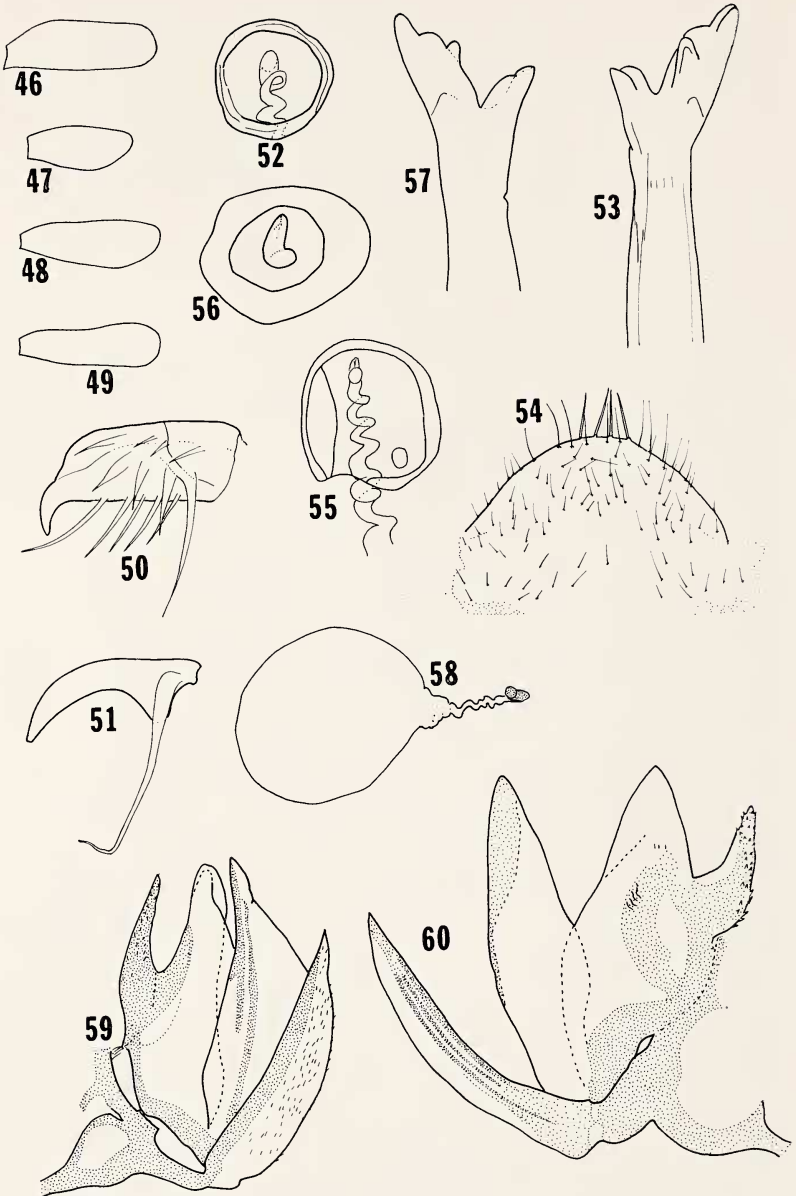
Diagnosis. — Wing markings essentially same as in *T. separatus* (Roesler). Spermathecal sac with long slender basal region and no constriction between wide and slender regions. Ovipositor valvulae: basal arms of first and second valvulae very short; secondary lobe of third valvula exceedingly spinose.

Female. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 70) with median cusp distinctly bidentate, lateral cusp with divided apex, 2 preapical denticles, one short and rounded, other longer, more slender, and protruding at an angle from cusp. Subgenital plate as described for the genus, and as figured for *T. bicolor*. Stem of T-shaped sclerite curved in preparation. Ovipositor valvulae (fig. 59) as described in diagnosis. Paraproctal sensorium with 7 trichobothria and 2 setae without basal rosettes.

Color (in alcohol). — Head, thorax, and legs largely dull ivory yellow. Head extensively marked with medium brown as follows: a broad band on each side of epicranial suture, each band bending laterally just before reaching lateral ocellus to end at antero-mesal margin of compound eye. Compound eyes bordered by medium brown spots. Frons bordered ventrally and laterally with medium brown and in middle with medium brown mark in form of rounded letter M. Genae behind antennal bases marked with reddish brown. Compound eyes black. Antennae reddish brown. Thorax marked on each side with 3 longitudinal parallel stripes of reddish brown, the lowest one mostly confined to coxal bases. Thorax dorsally extensively marked with reddish brown, but sutures and an elongate central spot dull ivory yellow. Abdomen with entire ventral surface dark reddish brown except for colorless posterior half of subgenital plate. Sides of abdomen dull ivory yellow, somewhat darker on clunium. Abdomen dorsally pale reddish brown. Posterior margins of epiproct and paraprocts reddish brown. Cell  $R_1$  of forewing in region underlying distal end of pterostigma and wing margin mostly





MOCKFORD — ELECTRENTOMOID PSOCIDS

colorless. Otherwise, wings marked as in *T. separatus* (Roesler).

Type locality. — 6 miles west of Macuspana, Tabasco, Mexico, April 3, 1964, E. L. Mockford collector. Holotype ♀, 1 ♀ paratype, and 8 nymphs. The types are in the author's collection.

Habitat. — The specimens were beaten from foliage of broad-leaved trees, shrubs, and palms in lowland rain forest.

### **Troctopsocus bicolor**, new species

Diagnosis. — Forewing marked (fig. 61) with a colorless band running through median cells and areola postica.

Male. — Measurements (Table I).

Morphology. — Hypandrium with posterior margin slightly curved. Phallosome (fig. 63) typical of the genus. Clunium and epiproct unadorned. Paraproctal sensorium with 7-8 trichobothria with well developed basal rosettes and 3-4 with weakly developed rosettes.

Color (in alcohol). — Body and legs pale reddish brown. Antennae somewhat darker reddish brown. Compound eyes dark reddish brown. Wings (figs. 61, 62) with veins white, membrane reddish brown except colorless band running diagonally across median cells and areola postica. Hindwing faint reddish brown except median cell colorless in its distal two-thirds.

Female. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 65) with lateral cusp bidenticulate; median cusp with tip apparently not divided, 2 denticles below

#### EXPLANATION OF PLATE 22

- Fig. 46. — *Protoctopsocus enigmaticus*, n. sp., ♀, distal segment of maxillary palpus.  
 Fig. 47. — *Troctopsocus morenus*, n. sp., ♀, distal segment of maxillary palpus.  
 Fig. 48. — *Troctopsocopsis martinicus*, n. sp., ♀, distal segment of maxillary palpus.  
 Fig. 49. — *Troctopsocus separatus* (Roesler), ♀, distal segment of maxillary palpus.  
 Fig. 50. — *Troctopsocopsis martinicus*, n. sp., ♀, anterior claw of posterior pretarsus.  
 Fig. 51. — *T. martinicus*, n. sp., ♀, posterior claw of posterior pretarsus.  
 Fig. 52. — *T. martinicus*, n. sp., ♀, sclerite of spermathecal opening.  
 Fig. 53. — *T. martinicus*, n. sp., ♀, lacinial tip.  
 Fig. 54. — *T. martinicus*, n. sp., ♀, subgenital plate.  
 Fig. 55. — *T. intermedius*, n. sp., ♀, sclerite of spermathecal opening.  
 Fig. 56. — *T. luciensis*, n. sp., ♀, sclerite of spermathecal opening.  
 Fig. 57. — *T. luciensis*, n. sp., ♂, lacinial tip.  
 Fig. 58. — *T. luciensis*, n. sp., ♀, spermatheca.  
 Fig. 59. — *Troctopsocus separatus* (Roesler), ♀, ovipositor valvulae.  
 Fig. 60. — *T. similis*, n. sp., ♀, ovipositor valvulae.

tip at very different levels, the lower one standing out from the cusp. Subgenital plate with apex only slightly tapering (fig. 64); arms of T-shaped sclerite obscure laterally. Ovipositor valvulae (fig. 66): first and second valvulae with long, slender stems; secondary lobe of third valvula beset with numerous tiny slender spines. Para-proctal sensorium with 8 trichobothria and 2 setae without basal rosettes.

Color (in alcohol). — Same as in male.

Type locality. — Chorróni Pass, Coast Range, Aragua, Venezuela (elevation 1550 m.), March 7, 1959, E. L. Mockford and C. J. Rosales collectors. Holotype ♂, allotype ♀, 3 ♀ paratypes, and 3 nymphs. The holotype, allotype, and 1 ♀ paratype will be deposited in the American Museum of Natural History, New York City. Remaining paratypes will be retained in the author's collection.

Habitat. — The type series was beaten from dried fern leaves in upland rain forest openings.

#### Family **Manicapsocidae**, new family

Diagnosis. — Antennae of 15 segments. Frontal sutures absent. Lacinial tip with lateral cusp curved outward and bearing a few indistinct, rounded denticles. No row of denticles on anterior carina of first femur. Tarsi three-segmented. Pretarsal claws each with a single preapical denticle. Pterostigma closed basally. Vein 2A of forewing joining wing margin distally or joining vein 1A. First segment of Rs in hindwing absent. Third ovipositor valvula not or only very slightly bilobed apically. Shades of red prominent in body coloration.

#### Genus *Manicapsocus* Smithers

*Manicapsocus* Smithers, 1965, Journ. Ent. Soc. S. Afr., 28:46

Diagnosis. — Vein 2A joining wing margin. Frons (from median ocellus to border with postclypeus) about equal in length to postclypeus. First flagellar segment curved. R<sub>1</sub> greatly expanded near wing margin, forming a dark spot. Epicranial plates raised into knobs mesad of compound eyes.

Type species. — *M. alettæ* Smithers (Angola).

#### Genus **Epitroctes**, new genus

Diagnosis. — Vein 2A joining 1A. Adults dimorphic, males macropterous and females micropterous. Frons longer than postclypeus in anterior view of head. Male forewings only very slightly

marked (fig. 72). First flagellar segment curved, tapering slightly from base to tip. Mesothoracic tergal lobes of male protruding only slightly above a line drawn from vertex to dorsal surface of abdomen.

Type species. — *E. tuxtlarum*, new species.

### **Epitroctes tuxtlarum**, new species

Male. — Measurements (Table I).

Morphology. — Lacinal tip (fig. 74) with median cusp single; lateral cusp with tip undivided; two distinct rounded denticles arising at different levels below tip and a third very indistinct denticle arising nearer tip; base of lateral cusp with a curved ridge. Hypandrium with distal margin slightly curved, region of margin beset with numerous setae. Phallosome (fig. 75) with parameres joined anteriorly to form a long rod with a more slender posterior extension beyond the point of junction of the parameres. Each paramere branching, the more lateral pair of branches curving around and abutting on each other posteriorly and each bearing a thumb-shaped process lateral to abutment; the more median branches each running straight a distance then curving to form spoon-shaped end to side of basally more lateral branch. Paraproctal sensorium with 10-11 setae, none with basal rosettes.

Color (in alcohol). — Head generally pale grayish brown, with pair of longitudinal white stripes through vertex and white spot including ocelli; two small red spots bordering compound eye ventrally and a broken red band across gena. Ocelli rimmed in red: the laterals mesally, the median dorsally. Compound eyes purple, beset with deep reddish-purple spots roughly arranged in bands across eye, each spot at base of a tiny seta. Sclerotized portions of thorax generally pale grayish brown. Well colored individual with a red lateral band running length of thorax each side. Red band across base of each coxa. Legs generally grayish brown; each femur with a red spot near distal end; each tibia with 2 reddish brown bands, one at about one-fourth distance from base, other at about three-fourths distance from base. Abdomen basad of clunium generally pale grayish brown dorsally and ventrally with a broad red band (continuous to tip) on each side; base with a rounded, well sclerotized dark brown spot dorsally; clunium, hypandrium, epiproct and paraprocts medium brown in cuticle, the red band running through each side subcuticularly to tip of each paraproct. Wings fumose, more deeply so in base of pterostigma and base of areola postica.

Female. — Measurements (Table I).

Morphology. — Subgenital plate (fig. 76) with posterior margin rounded; T-shaped sclerite with arms broad and diffuse. Ovipositor valvulae (fig. 77): third valvula with notch near apex marking presence of secondary lobe. Spermatheca (fig. 78): sac of two distinct regions separated by a constriction, the part proximal to the duct a narrow, tapering, curved neck. Paraproctal sensorium with 8 setae, none with true basal rosettes.

Color (in alcohol). — Head same as in male except frons grayish white with two pale grayish brown spots below ocelli. Thorax same as in male except for presence of a red band running length of thorax on dorsal midline. Abdomen same as in male except that dark brown dorsal spot at base much larger, covering all of first two terga.

Type locality. — Upland rain forest 8 miles northwest of Santiago Tuxtla, Veracruz, Mexico (Sierra de las Tuxtlas), June 24, 1966, E. L. Mockford collector. Holotype ♂, allotype ♀, 2 ♂ paratypes, and 1 nymph. Types are in the author's collection.

Habitat. — These insects were found on the trunk of a large tree with buttressed base deep in the upland rain forest. On the same trunk in the immediate vicinity of these specimens were several species of Ptiloneurid psocids.

Discussion. — A single female, probably representing a distinct species of this genus, was taken at Chorróni, Aragua State, Venezuela, in the coastal mountains. Like the Mexican female, it is micropterous.

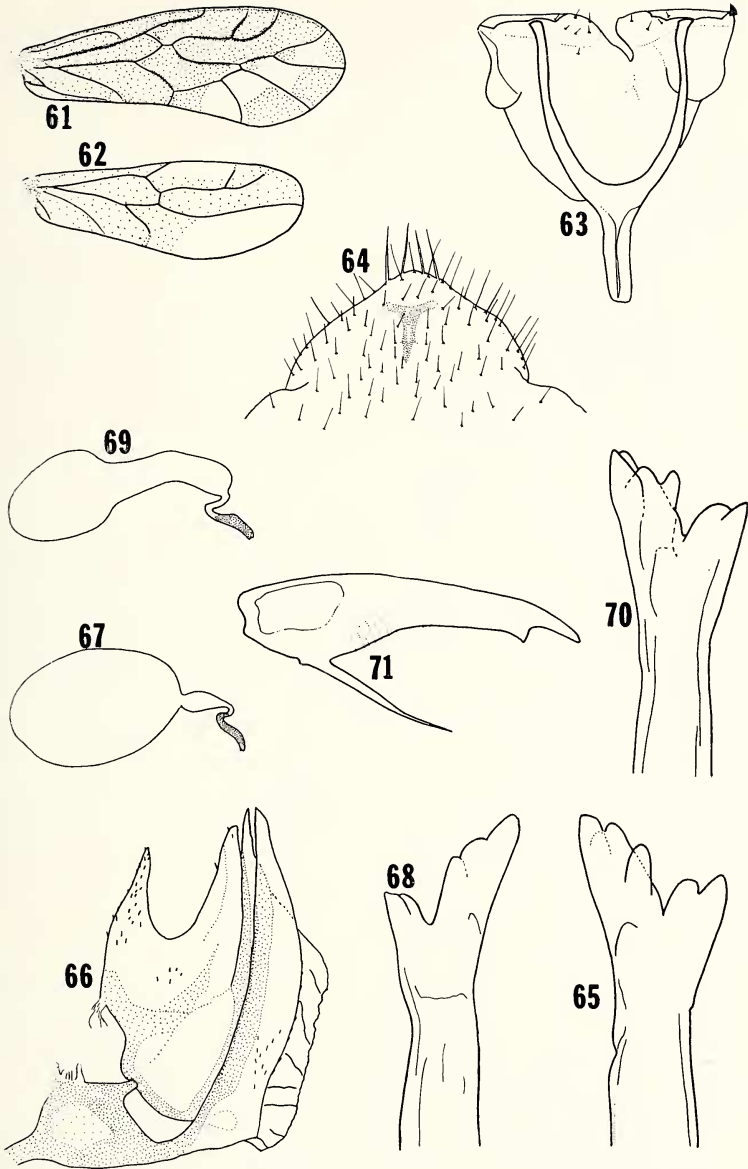
#### Family **Compsocidae**, new family

Diagnosis. — Antennae of 13 or 14 segments. Frontal sutures present. Lacinial tip with lateral cusp curved outward and bearing a few indistinct, rounded denticles. Row of denticles present on anterior carina of first femur. Tarsi three-segmented. Pretarsal claws each with two preapical denticles. Mesothoracic tergal lobes not protruding above a line drawn from vertex of head to dorsal

---

#### EXPLANATION OF PLATE 23

- Fig. 61. — *Troctopsocus bicolor*, n. sp., ♀, forewing.  
 Fig. 62. — *T. bicolor*, n. sp., ♀, hindwing.  
 Fig. 63. — *T. bicolor*, n. sp., ♂, phallosome.  
 Fig. 64. — *T. bicolor*, n. sp., ♀, subgenital plate.  
 Fig. 65. — *T. bicolor*, n. sp., ♀, lacinial tip.  
 Fig. 66. — *T. bicolor*, n. sp., ♀, ovipositor valvulae.  
 Fig. 67. — *T. separatus* (Roesler), ♀, spermatheca.  
 Fig. 68. — *T. separatus* (Roesler), ♀, lacinial tip.  
 Fig. 69. — *T. similis*, n. sp., ♀, spermatheca.  
 Fig. 70. — *T. similis*, n. sp., ♀, lacinial tip.  
 Fig. 71. — *Epitroctes tuxtларum*, n. sp., ♂, pretarsal claw.



MOCKFORD — ELECTRENTOMOID PSOCIDS

surface of abdomen. Pterostigma closed basally. Vein 2A of forewing joining vein 1A. First segment of Rs in hindwing present or absent. Vein M in hindwing one-branched. Third ovipositor valvula deeply bilobed apically.

### Genus *Compsocus* Banks

*Compsocus* Banks, 1930, Psyche, 37:183.

Diagnosis. — Antennae of 14 segments. Frons approximately equal in length with postclypeus in anterior view. Pretarsal claws each with two preapical teeth. First segment of Rs in hindwing present. Minute scale-like structures present on forewing surfaces. Spermathecal duct straight.

Type species. — *C. elegans* Banks.

### *Compsocus elegans* Banks

*Compsocus elegans* Banks, 1930, Psyche 37:183-184, pl. 9, fig. 4.

Male. — Measurements (Table I).

Morphology. — Lacinial tip (fig. 89) with median cusp slightly divided; lateral cusp with apex simple, bearing two low, rounded denticles rising at same level near apex. Anterior femur with row of 15-16 denticles (fig. 79), some of them bifid. Hypandrium (fig. 84) with apical margin curved, slightly impressed in middle. Phallosome (fig. 85) in form of letter Y but closed posteriorly, the stem about half length of arms; each arm dividing about halfway along its length to produce a more membranous lateral branch and a more sclerotized median branch, the lateral branch terminating as a sac surrounding median branch and becoming closely associated medially with complex apical sclerites of phallosome; this sac bearing field of pores on outer margin near its posterior end. Paraproctal sensorium with 5-6 trichobothria and 7 shorter setae lacking basal rosettes. Epiproct with field of closely set rather stout setae at its tip.

Color (in alcohol). — Not recorded except for wing pattern, due to very poor condition of specimen. Forewing (fig. 82) complexly mottled with gray, pale brown, and colorless spots, the gray mostly in 5 transverse spots: an obscure one at wing tip, a small one from distal end of cell  $R_1$  through cell  $R_3$  and cell  $R_5$ ; a large one covering most of pterostigma and extending posteriorly through base of cell  $M_2$ ; slender one from wing margin just basad of pterostigma back through cell  $M_3$ ; wide one from middle of costal cell through anal cells just basad of nodulus; remainder of wing membrane largely pale brown except for 3 colorless (or nearly so) spots: one through

tip of areola postica extending up across cell  $M_3$  another along vein  $Cu_{1a}$ , another through nodulus. Hindwing washed with pale brown, unmarked.

Female. — Measurements (Table I).

Morphology. — Anterior femur with many more denticles in row than in male (39 in single femur observed). Subgenital plate (fig. 86) with posterior margin tapering toward apex, the apex bearing two long, stout setae; T-shaped sclerite with pair of lateral extensions arising along stem near its base. Ovipositor valvulae (fig. 87). Spermatheca (fig. 88) with no constriction separating the two regions of its sac; basal region very small; wall of sac beset with small rings of minute, inward-directed spines; sclerite of spermathecal orifice a V-shaped structure with a sclerotized band bisecting the angle of the V; actual orifice near apex of the V. Paraproctal sensorium with 12-13 setae, none with well developed basal rosettes.

Color (in alcohol). — Head, legs, and mesothoracic dorsum dark brown. Compound eyes gray showing faintly three transverse brown bands. Metathorax dorsally and entire thorax laterally medium brown. Preclunial portion of abdomen ventro-laterally medium brown with reddish hue, pale brown dorsally and ventrally. Subgenital plate and clunium medium brown mottled with darker brown. Wings marked as in male, the pale brown areas of forewing with silvery sheen in reflected light.

Type locality. — Barro Colorado Island, Panama Canal Zone.

Records. — Mexico. *Chiapas*: Palenque Ruins. Panama Canal Zone. Fort Sherman.

Habitat. — Mexican specimens, two females and seven nymphs, were taken on trunks of large forest trees with buttressed bases. They sit on the surface of bark and run rapidly when disturbed.

#### Genus *Electrentomopsis*, new genus

Diagnosis. — Antennae of 13 segments. Frons only very slightly longer than postclypeus in anterior view. Micro-vestiture of forewing minute points. Spermathecal duct coiled spring-like.

Type species. — *E. variegatus*, new species.

#### *Electrentomopsis variegatus*, new species

Male. — Measurements (Table I).

Morphology. — Pit containing antennal base particularly deep and conical as seen in cleared head. Sculpture of integument of frons and vertex a net of polygonal areas (mostly hexagonal) set off by lines. Compound eyes with transverse rows of scattered tiny setae. Lacinial



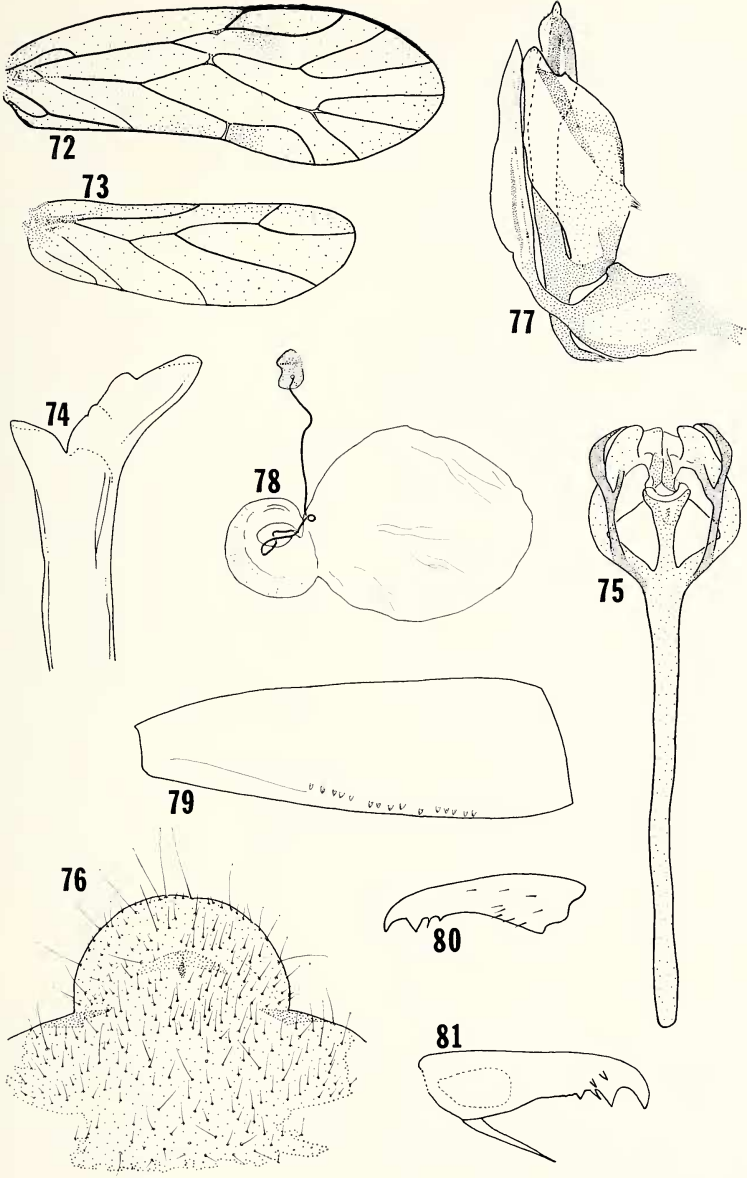
tip (fig. 90) with simple median cusp; lateral cusp with apex simple, broadly rounded; one large, rounded denticle below apex, and apparently one smaller one at same level on opposite edge; a ridge at base of lateral cusp. Anterior femur with row of 13 spines, irregularly spaced, along anterior carina (fig. 91). Hypandrium with posterior margin rounded and bearing numerous setae, two close to center longer than others. Phallosome (fig. 100): parameres in form of letter Y, the stem formed of fused bases; around posterior end of each arm a membranous sac, slightly sclerotized posteriorly and beset posteriorly and medially with rounded pores; these sacs apparently continuous medially with endophallus, a bilobed sac containing on its inner wall several longitudinal rows of denticles fused to form saw-blade-like structures. Paraproctal sensorium with 5-6 setae with poorly developed basal rosettes and 4-5 without basal rosettes.

Color (in alcohol).—Head with flattened dorsal part of vertex gray, anterior face of vertex dark reddish brown in upper half, separated from gray dorsum by white transverse stripe, the reddish brown region containing two white spots, one near each compound eye; lower half of anterior face of vertex grayish orange; upper half of frons white mottled with gray, the included median ocellus dark brown, this white region partially separated from bright orange lower half of frons by a line of reddish brown spots. Postclypeus pale grayish green mottled near its upper border with dark reddish brown; gena white with reddish brown stripe below compound eye and another just above base of mandible. Antennae dark brown. Compound eyes bright yellowish green with 6 transverse bands of darker green, each darker band including one of the rows of tiny setae, each seta arising from a tiny dark brown spot. Mesothorax dorsally yellowish green mottled with few reddish brown spots. Metathorax dorsally reddish brown. Thorax laterally white mottled with reddish brown. Anterior and middle coxae and femora pale gray, the femora

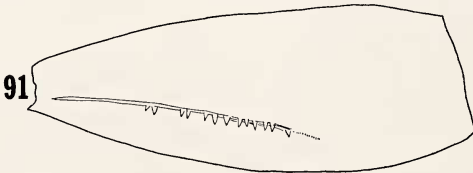
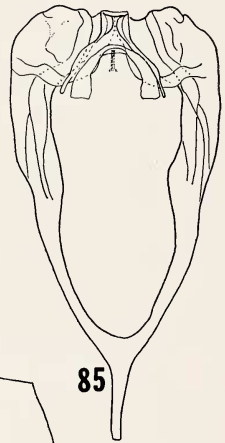
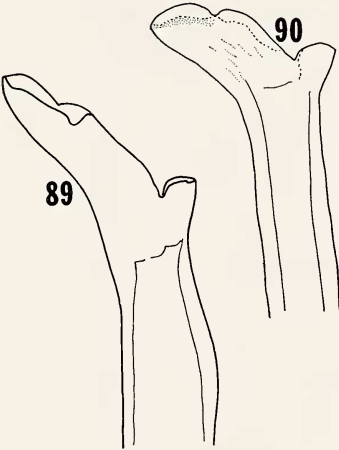
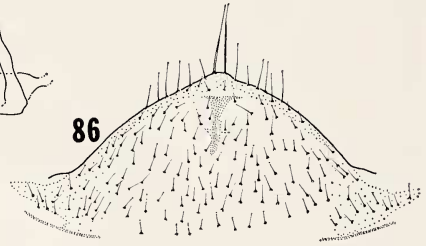
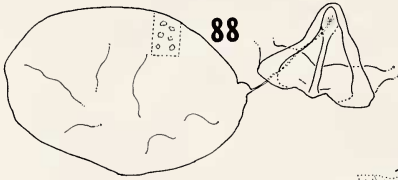
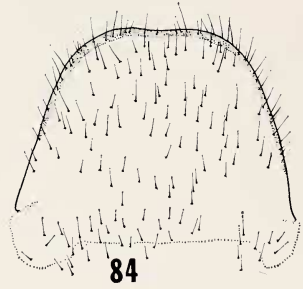
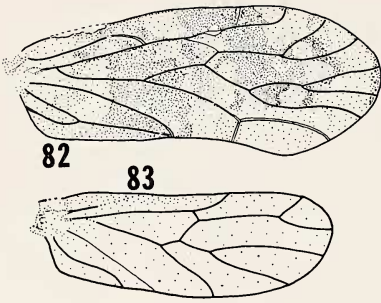
---

EXPLANATION OF PLATE 24

- Fig. 72.—*Epitroctes tuxtларum*, n. sp., ♂, forewing.  
 Fig. 73.—*E. tuxtларum*, n. sp., ♂, hindwing.  
 Fig. 74.—*E. tuxtларum*, n. sp., ♂, lacinial tip.  
 Fig. 75.—*E. tuxtларum*, n. sp., ♂, phallosome.  
 Fig. 76.—*E. tuxtларum*, n. sp., ♀, subgenital plate.  
 Fig. 77.—*E. tuxtларum*, n. sp., ♀, ovipositor valvulae.  
 Fig. 78.—*E. tuxtларum*, n. sp., ♀, spermatheca.  
 Fig. 79.—*Compsocus elegans* Banks, ♂, anterior femur.  
 Fig. 80.—*C. elegans* Banks, ♀, pretarsal claw.  
 Fig. 81.—*Electrentomopsis variegatus*, n. sp., ♂, pretarsal claw.



MOCKFORD — ELECTRENTOMOID PSOCIDS



each with two dark brown bands, one through middle and one through distal end. Anterior and middle tibiae and tarsi largely pale brown, tibiae each with basal and subapical dark brown bands and apical white band; tarsi each with basal dark band and with second segment darker than region basal or distal to it. Posterior coxae medium brown; posterior femora each mostly dark brown with pale gray apical band; posterior tibia largely pale gray with irregular brown spots along outer face and a dark brown band just distal of middle. Abdomen white along sides, mottled dark brown and pale brown dorsally with a largely dark brown band including most of terga 2 through 4; ventrally mottled with dark brown, white, and a colorless region underlying seminal vesticles; a mottled, largely dark brown band including sterna 2 through 4; hypandrium dark brown; clunium pale brown mottled with reddish brown; epiproct and paraprocts white mottled with dark brown. Forewing (fig. 98) with brown and grayish brown spots: one at end of each longitudinal vein, two in costal cell, a series forming an arc with one each in cells  $R_1$ ,  $R_3$ ,  $R_5$ ,  $M_1$  and  $M_2$ , a large pale one partly in base of cell  $R_5$  but largely in cell  $M_3$ , a dark one through areola postica extending forward into cell  $M_3$ , and a few other minor ones. Hindwing (fig. 99) unmarked, clear.

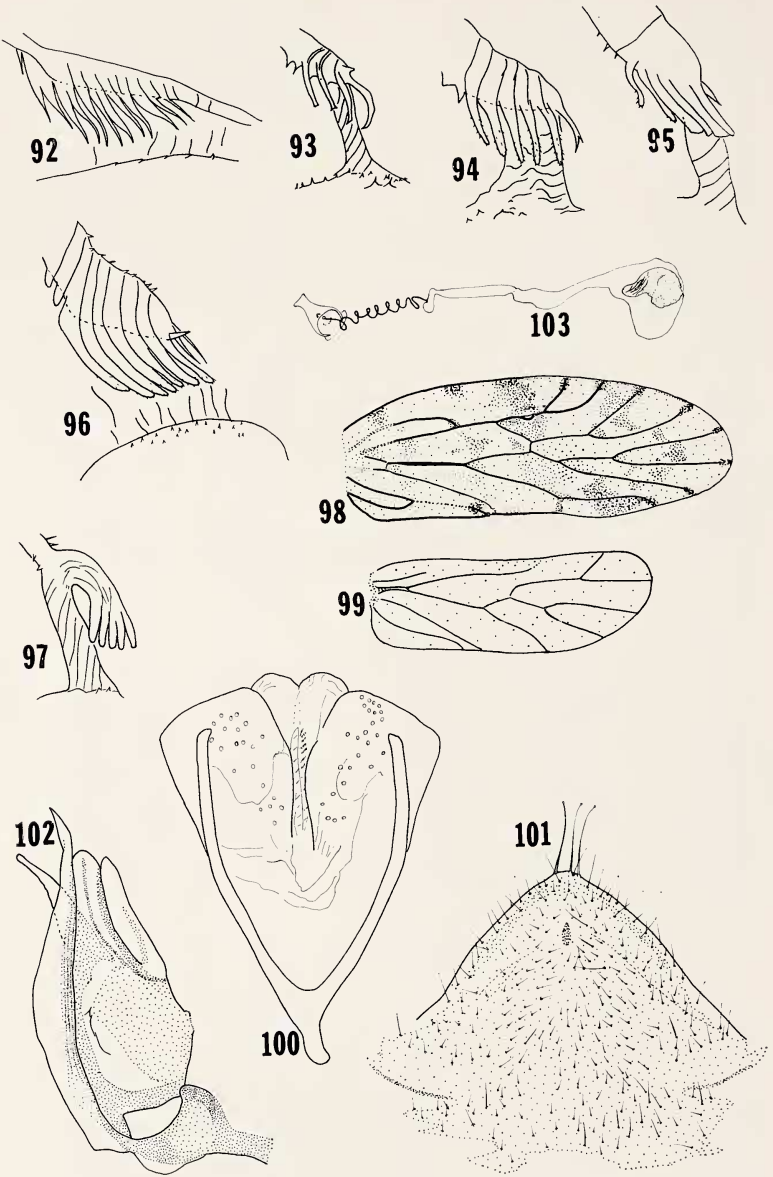
Female. — Measurements (Table I).

Morphology. — Subgenital plate (fig. 101) tapering toward apex, the apex somewhat truncated and bearing 2-3 setae longer and stouter than others; T-shaped sclerite vague, lacking arms. Ovipositor valvulae (fig. 102) with first and second valvulae closely associated along their median edges with sclerite or orifice of spermatheca; third valvula deeply bilobed. Spermatheca (fig. 103) with sac composed of two regions, both elongated, the one further from duct expanded in its blind end. Paraproctal sensorium with 2 setae

---

EXPLANATION OF PLATE 25

- Fig. 82. — *Compsocus elegans* Banks, ♂, forewing.  
 Fig. 83. — *C. elegans* Banks, ♂, hindwing.  
 Fig. 84. — *C. elegans* Banks, ♂, hypandrium.  
 Fig. 85. — *C. elegans* Banks, ♂, phallosome.  
 Fig. 86. — *C. elegans* Banks, ♀, subgenital plate.  
 Fig. 87. — *C. elegans* Banks, ♀, ovipositor valvulae.  
 Fig. 88. — *C. elegans* Banks, ♀, spermatheca (dotted lines enclosing example of surface sculpture which is same over entire spermatheca).  
 Fig. 89. — *C. elegans* Banks, ♂, lacinial tip.  
 Fig. 90. — *Electrentomopsis variegatus*, n. sp., ♂, lacinial tip.  
 Fig. 91. — *E. variegatus*, n. sp., ♂, anterior femur.



with basal rosettes, 4 setae each with a narrow unsculptured ring around its socket, and 4 setae with neither basal rosette nor unsculptured ring.

Color (in alcohol).— Essentially same as in male.

Type locality. — Ejido Libertad, about 4 miles west of Frontera, Tabasco, Mexico, June 27 and July 3, 1966, E. L. Mockford, R. Sloan, and A. Manzano collectors. Holotype ♂, allotype ♀, 6 ♂ and 2 ♀ paratypes and 5 nymphs. Types are at present in author's collection.

Habitat. — This species was taken on trunks of large trees with buttressed bases in lowland rain forest. These insects sit on the surface of bark and run rapidly when disturbed.

### Genera Incertae Sedis

#### Genus *Electrentomum* Enderlein

*Electrentomum* Enderlein, 1911. Palaeontographica 58:337.

Diagnosis. — Antennae of 13 segments. Frontal sutures absent. Lacinial tip with lateral cusp curved outward and bearing a few indistinct, rounded denticles. Tarsi three-segmented. Pretarsal claws each with a single preapical denticle. Pterostigma closed basally. Vein 2A of forewing joining vein 1A. First segment of Rs in hindwing absent.

Type species: *E. klebsianum* Enderlein (Baltic amber).

Note: Enderlein's statement (1911:338) "1. *Hintertarsenglied mit ca. 21 Ctenidiobothrien*" is apparently in error. His figure of the posterior tarsus (Pl. XXIV, Fig. 75) shows only ordinary bristles without basal ctenidia. Compare his figure 52 on the same plate showing a psocid with ctenidiobothria.

#### EXPLANATION OF PLATE 26

- Fig. 92. — *Thylacopsis* sp. (Suborder Trogiomorpha), in-flight wing clasp.  
 Fig. 93. — *Musapsocus creole*, n. sp., ♀, in-flight wing clasp.  
 Fig. 94. — *Protroctopsocus enigmaticus*, n. sp., ♀, in-flight wing clasp.  
 Fig. 95. — *Electrentomopsis variegatus*, n. sp., ♂, in-flight wing clasp.  
 Fig. 96. — *Pseudoseopsis hellmani* Mock. and Gurn., ♀, in-flight wing clasp.  
 Fig. 97. — *Hemipsocus* sp. (Suborder Psocomorpha), in-flight wing clasp.  
 Fig. 98. — *Electrentomopsis variegatus*, n. sp., ♂, forewing.  
 Fig. 99. — *E. variegatus*, n. sp., ♂, hindwing.  
 Fig. 100. — *E. variegatus*, n. sp., ♂, phallosome.  
 Fig. 101. — *E. variegatus*, n. sp., ♀, subgenital plate.  
 Fig. 102. — *E. variegatus*, n. sp., ♀, ovipositor valvulae.  
 Fig. 103. — *E. variegatus*, n. sp., ♀, spermatheca.

Genus *Parelectrentomum* Roesler

*Parelectrentomum* Roesler, 1940. Zool. Anz. 129:228.

Diagnosis. — Differing from *Electrentomum* according to original description, by presence of first segment of Rs in hindwing, and relatively larger medial stem compared to medial branches in forewing.

Type species. — *P. prescum* Roesler (Baltic amber).

## PHYLOGENETIC RELATIONSHIPS OF THE ELECTRENTOMOID PSOCIDS

Hennig (1966) has stressed the predictive value of phylogenetic classification and has emphasized that only apomorphous (derived) characters may be used for setting out monophyletic groups, while plesiomorphous (primitive) characters are useless for this purpose.

Phylogenetic problems of two sorts (taxonomic levels) are considered in this section. First, what are the phylogenetic relationships of the Electrentomoid families to other families of Psocoptera? Secondly, what are the phylogenetic relationships among the genera within the Family Troctopsocidae?

Enderlein (1911) placed *Electrentomum* as the sole representative of one branch of a basal dichotomy of the family Amphientomidae. Roesler (1944) recognized a distinct family Plaumannidae for his genus *Plaumannia* (= *Troctopsocus*) and within the Amphientomidae recognized a subfamily Electrentominae for *Electrentomum* and *Parelectrentomum* and a subfamily Compsocinae for *Compsocus*. The remainder of the Amphientomidae were placed in two subfamilies, Amphientominae and Tineomorphinae.

Pearman (1936) set up a group Amphientometae which would encompass the taxa mentioned above.

We must decide first whether or not the Amphientometae is a phylogenetically valid taxon, i.e. can it be characterized by at least a few apomorphous traits?

The group Amphientometae may be diagnosed as follows (modified from Badonel, 1951): Adults with three tarsal segments, antennae with 15 segments, the flagellar segments annulated; labial palpi one- or two-segmented; three, two, or no ocelli, well separated when present; forewings with pterostigma not thickened, with nodulus and second anal vein, and with apex rounded; coxal organ reduced to the mirror.

To this list may be added the following characters shared by a number of species of Amphientomidae with a number of species of electrentomoids, but not universal: Antennal socket sunk in a pit, the

pit separated from frontoparietal region by a ridge; two median veins present in hindwing; Sc rejoining R in forewing; a ridge running length of anterior coxa along its antero-lateral surface; compound eyes transversely color banded; a row of spines or denticles on anterior carina of first femur; R forked in forewing immediately basal to pterostigma; a T-shaped sclerite or homologous structure present on subgenital plate; third valvula deeply bilobed; pretarsal claw with a longitudinal series of spines, setae, or minute ridges on its lower surface.

It is very difficult to decide which of the above conditions are plesiomorphous and which are apomorphous for the Amphientometae. Only two methods are available for solution of this problem: comparisons with fossil forms, and comparisons with other modern, presumably monophyletic groups of psocids and orders of other insects.

Comparison with the Permian psocids (Carpenter, 1933) shows that the following characters are probably plesiomorphous for the order: three tarsal segments; forewing with pterostigma not thickened, with second anal vein, and with apex rounded; antennal socket sunk in a pit, the pit separated from fronto-parietal region by a ridge (see Carpenter, 1933, fig. 13); Sc rejoining R in forewing.

Three other groups of psocids are available for comparison: Suborder Trogiomorpha, Group Nanopsocetae, and Suborder Psocomorpha. If they are monophyletic groups not including or included within the Amphientometae, they may be compared with the Amphientometae for testing plesiomorphy or apomorphy of characters.

The Suborder Trogiomorpha is probably monophyletic on the basis of the apomorphous character of considerable reduction of the first and second ovipositor valvulae and enlargement of the third valvula. The Group Nanopsocetae is probably monophyletic on the basis of small size and associated simplification of wing venation. The Suborder Psocomorpha is probably monophyletic on the basis of the thickened pterostigma and enlargement of the mesothorax.

In the classification generally in vogue at present, the Group Nanopsocetae is regarded as a sister group with the Amphientometae, the two groups composing the Suborder Troctomorpha. Although the Nanopsocetae is probably monophyletic, it is necessary to try to determine if it is phylogenetically coordinate with the Amphientometae or if a subordination relationship may exist between the two.

This question can be answered in part on the basis of distribution of the nodulus. This structure, the distal junction of veins  $Cu_2$  and 1A in the forewing, which bears the in-flight wing coupling device, is present in Group Psocatropetae (Suborder Trogiomorpha),



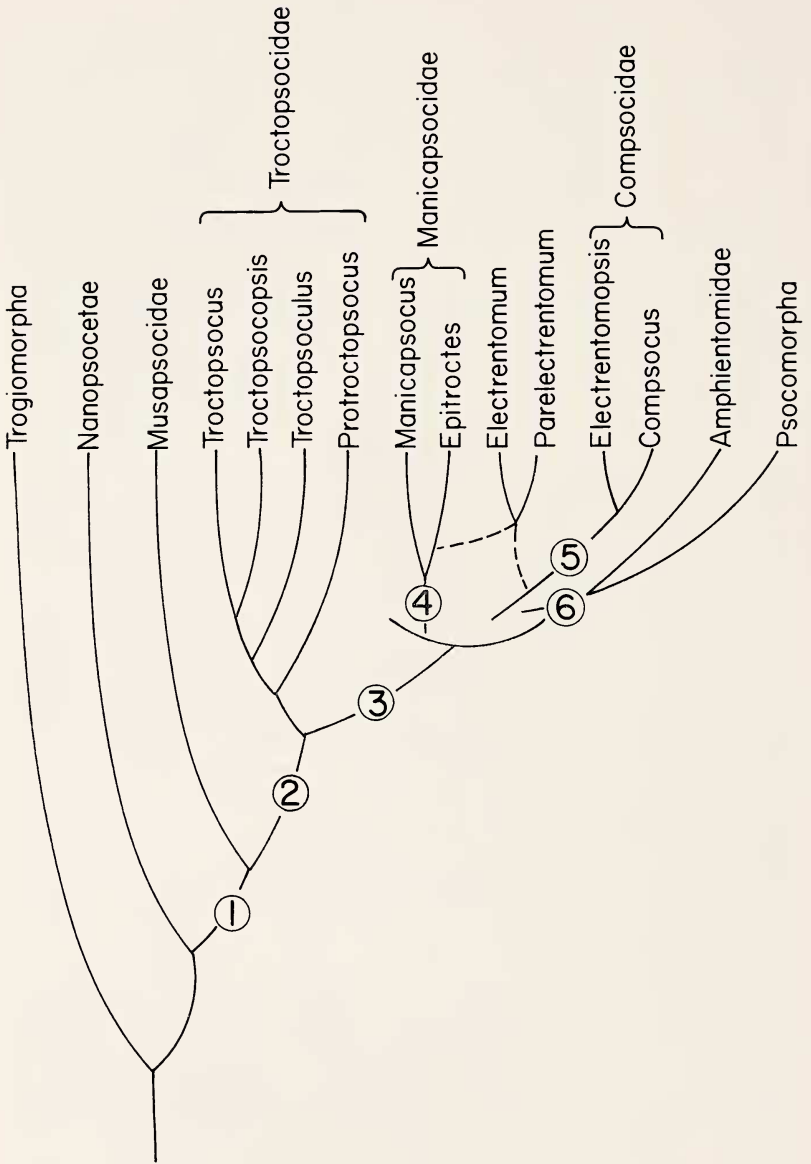


FIGURE 104

Group Amphientometae, and Suborder Psocomorpha. It is apparently universally absent in the Permian fossil psocids, which strongly suggests that its absence is the plesiomorphous condition for the order, and that it has arisen several times independently (at least twice) within the order. Its absence in the Nanopsocetae rules out the possibility that this group is phylogenetically subordinate to the Amphientometae. At the same time its absence in most members of the Suborder Trogiomorpha establishes the same thing for that group, with regard to their relationship to the Amphientometae and to the Suborder Psocomorpha. The Trogiomorpha also cannot be subordinate to the Nanopsocetae, as they bear several plesiomorphous characters which the Nanopsocetae lack ( $M_3$  present in forewing, Cu branched in hindwing).

The Suborder Trogiomorpha and the Group Nanopsocetae, then, appear to be valid monophyletic lines not included in the Amphientometae. At the same time, possession of a nodulus shows the Amphientometae to be a monophyletic group and its possession of vein 2A of the forewing shows it to be not included within either Trogiomorpha or Nanopsocetae.

It is now necessary to try to decide whether Suborder Psocomorpha is phylogenetically coordinate with the Amphientometae or if a subordinate relationship exists between them. On the basis of characters used above to establish monophyly of the Psocomorpha, the phylogenetic subordination of the Amphientometae to the Psocomorpha is ruled out.

It must be noted that the Family Amphientomidae shares a number of characters with the Psocomorpha. These include tarsal ctenidiotrophia, lacinia with lateral cusp curved out and bearing short denticles, and the greatly enlarged postclypeus, which is longer than frons in anterior view of face. These characters have good probability of being shared through synapomorphy, hence marking a monophyletic line.

---

Fig. 104. — Dendrogram showing probable phylogenetic relationships of major lines of Psocoptera and families and genera of *Electrentomoid* psocids. Numbers refer to following notations: (1) nodulus acquired; (2) third valvula bilobed apically; (3) lateral cusp of lacinial tip curved outward, bearing low, rounded denticles; (4) third valvular lobes reunited, spines or denticles of first femur absent; (5) vein M of hindwing branched, compound eyes color-banded; (6) tarsal ctenidiotrophia present.

The assumption of such a line allows reasonable explanation of the evolution of the in-flight wing coupling mechanism, from a set of pointed, separated spines in the Trogiomorpha through truncated spines set close together in the Amphientomidae, to a hook composed of truncated spines fused at their bases in the Psocomorpha. If the electrentomoid families are placed along the line leading to the Amphientomid-Psocomorph group as in the dendrogram (fig. 104) more steps are added to the in-flight wing coupling mechanism series (figs. 92 through 97). The absence of this structure in Nanopsocetae is probably secondary. The lacinial tips and ovipositor valvulae also form rational series along this line.

It appears, therefore, that the Psocomorpha are phylogenetically included within the Amphientometae as a terminal monophyletic group. There are, however, some characters which suggest a contrary conclusion. For example, the rasp of the coxal organ is found in the Psocomorpha and Trogiomorpha but not in the Amphientometae or Nanopsocetae. This would be regarded as a new apomorphous development of the Psocomorpha in the theory developed above.

The relationship of the Nanopsocetae to the Trogiomorpha and the line bearing the Amphientometae and Psocomorpha still needs to be investigated. The Nanopsocetae and Amphientometae have been placed close together on the basis, in part, of plesiomorphous characters. However, it appears that the T-shaped sclerite of the subgenital plate, the tympanum of the posterior coxa, and ringing sculpture patterns of the antennal flagella, all characters absent in the Trogiomorpha and apparently absent in closely related orders, are here apomorphous and mark out a Nanopsocetae-Amphientometae line.

The electrentomoid families, then, bridge the gap between the Nanopsocetae and Amphientomidae. This accounts for why we find within this series of families forms very similar to the Nanopsocetae (*Musapsocus*, with lacinial tip of three tines and third valvula simple) and other forms very similar to the Amphientomidae (*Compsocus*, with lateral cusp of lacinial tip curved and bearing short, rounded denticles, third valvula deeply bilobed, compound eyes transversely color-banded). They arise precisely between the point on the line leading to Amphientomidae and Psocomorpha where the nodulus is acquired and the point where ctenidiobothria are acquired.

It must be noted that most of the species of the electrentomoid complex commonly share one apomorphous character: the junction of veins 1A and 2A in the forewing. This character is not universal, however, being absent in *Musapsocus huastecanus* and in *Manicapso-*

*cus alettae*. It occurs to very different extents in the different groups, and probably represents repeated parallel occurrences.

The families of electrentomoid psocids are arranged on the dendrogram (fig. 104) in order of appearance of various structures. The numbers in the internodes of the dendrogram refer to these structures listed in the explanation. The precise phylogenetic relationship between the Manicapsocidae and Compsocidae cannot be established with information now at hand. The two groups are apparently very close, and additional information may allow them to be united.

The fossil forms *Electrentomum* and *Parelectrentomum* are not yet well enough known to be placed with certainty in this scheme. They apparently belong either in the Manicapsocidae or Compsocidae, in one of the two possible positions indicated on the dendrogram.

The positions of the Troctopsocid genera within their family require explanation. At the first dichotomy, *Protroctopsocus* retains the apparently plesiomorphous traits of closed pterostigma, a row of spines on the anterior carina of the first femur (shared with Compsocidae, Amphientomidae, and some Psocomorpha), and 15 antennal segments (shared with Nanopsocetae, Manicapsocidae, and some Amphientomidae). It is specialized in form of the T-shaped sclerite and in possession of an m-cu crossvein in the forewing. At the next dichotomy, *Troctopsocus* retains pretarsal claws alike, while its antennae are reduced to 11 segments. The remaining branch has pretarsal claws dissimilar while retaining 13 antennal segments.

Certain major changes in classification of the Psocoptera are called for by the phylogenetic scheme proposed above. For example, the Troctomorpha and Psocomorpha cannot be retained as taxa at the same hierarchical level. I believe that these ideas should receive the benefit of thoughts of other psocid investigators before such changes are proposed.

#### LITERATURE CITED

- BADONNEL, A.  
1951. Ordre des Psocoptères, in Grassé, P., *Traite de Zoologie*, 10, fasc. 2:1301-1340.
- BANKS, N.  
1930. Some new neotropical neuropteroid insects. *Psyche* 37:183-191.
- CARPENTER, F. M.  
1933. The Lower Permian insects of Kansas. 6. *Proc. Amer. Acad. Arts Sci.* 68:411-503.
- ENDERLEIN, G.  
1911. Die fossilen Copeognathen und ihre Phylogenie. *Palaeontographica* 58:279-360, Pls XXI-XXVII.
- HENNIG, W.  
1966. *Phylogenetic Systematics*. Urbana, 263 pp.

LUNDBLAD, O.

1936. Neue Wassermilben aus Santa Catharina in Südbrasilien. Zool. Anz. 115:29-51.

MOCKFORD, E. L.

1966. The Family Electrentomidae (Psocoptera). Abstract. Proc. N.-C. Branch, Ent. Soc. Amer. 21:85.

PEARMAN, J. V.

1936. The taxonomy of the Psocoptera: preliminary sketch. Proc. R. Ent. Soc. Lond. (B) 5:58-62.

ROESLER, R.

1940. Neue und wenig bekannte Copeognathengattungen 1. Zool. Anz. 129:225-243.

1944. Die Gattungen der Copeognathen. Stett. Ent. Zeit. 105:117-166.

SMITHERS, C. N.

1965. Descriptions and new records of Atropetae, Psocatropetae, and Amphientometae (Psocoptera) from Africa. Journal Ent. Soc. S. Afr. 28:44-49.

Table I. Measurements (in mm.) and Ratios of Electrentomoid psocids.

	Forewing length	Posterior tib. length	Posterior t <sub>1</sub> length	Posterior t <sub>2</sub> length	Posterior t <sub>3</sub> length	$\frac{IO}{D}$	PO
<i>Muscapsocus huastecanus</i> , n.sp., ♂							
Sample Size	12	12	12	12	—	12	12
Minimum	2.09	0.81	0.34	0.13	—	0.87	0.66
Maximum	2.31	0.96	0.37	0.15	—	1.05	0.87
Mean	2.19	0.89	0.35	0.14	—	0.96	0.73
S.D.	0.068	0.038	0.010	0.007	—	0.047	0.057
<i>Musapsocus huastecanus</i> , n.sp., ♀							
Sample Size	13	13	13	13	—	13	13
Minimum	2.04	0.76	0.32	0.12	—	0.90	0.65
Maximum	2.31	0.89	0.36	0.15	—	1.14	0.87
Mean	2.15	0.85	0.34	0.14	—	1.02	0.73
S.D.	0.085	0.041	0.011	0.008	—	0.059	0.057
<i>Musapsocus creole</i> , n.sp., ♂							
Sample Size	6	6	6	6	—	6	6
Minimum	2.00	0.76	0.31	0.12	—	0.78	0.72
Maximum	2.15	0.83	0.36	0.13	—	0.91	0.80
Mean	2.08	0.79	0.34	0.13	—	0.86	0.76
S.D.	0.053	0.026	0.017	0.006	—	0.052	0.03
<i>Musapsocus creole</i> , n.sp., ♀							
Sample Size	10	10	10	10	—	10	10
Minimum	1.82	0.69	0.27	0.11	—	0.87	0.77
Maximum	2.09	0.81	0.35	0.14	—	1.02	0.88
Mean	1.96	0.77	0.32	0.12	—	0.96	0.81
S.D.	0.072	0.039	0.024	0.009	—	0.047	0.03

Table I. Measurements (in mm.) and Ratios of *Electrentomoid* psocids.

	Forewing length	Posterior tib. length	Posterior t <sub>1</sub> length	Posterior t <sub>2</sub> length	Posterior t <sub>3</sub> length	$\frac{IO}{D}$	PO
<i>Musapsocus tabascensis</i> , n.sp., ♂							
Sample size	4	4	4	4	—	4	4
Minimum	1.67	0.75	0.30	0.11	—	0.88	0.69
Maximum	1.89	0.77	0.33	0.13	—	0.92	0.78
Mean	0.79	0.76	0.31	0.12	—	0.90	0.74
S.D.	0.091	0.010	0.009	0.010	—	0.019	0.034
<i>Musapsocus tabascensis</i> , n.sp., ♀							
Two specimens	1.93	0.80	0.33	0.13	—	0.91	0.69
	1.78	0.71	0.33	0.13	—	0.94	0.73
<i>Musapsocus birkenholzi</i> , n.sp., ♂							
One specimen	1.89	0.83	0.31	0.13	—	0.91	0.69
<i>Musapsocus simlac</i> , n.sp., ♀							
One specimen	1.84	—	—	—	—	0.87	0.79
<i>Proctopsocus enigmaticus</i> , n.sp., ♀ (brachypterous)							
Sample size	10	10	10	10	10	10	10
Minimum	1.98	0.94	0.45	0.08	0.09	2.00	0.55
Maximum	2.22	1.01	0.50	0.10	0.10	2.16	0.63
Mean	2.08	0.97	0.47	0.09	0.10	2.07	0.59
S.D.	0.082	0.023	0.016	0.004	0.004	0.063	0.022
<i>Proctopsocus enigmaticus</i> , n.sp., ♀ (macropterous)							
Three specimens	3.26	0.99	0.49	0.09	0.10	2.05	0.55
	3.24	1.04	0.49	0.10	0.10	2.03	0.60
	3.49	1.06	0.50	0.09	0.10	2.03	0.60
<i>Troctopsoculus morenus</i> , n.sp., ♀							
One specimen	1.53	0.48	0.23	0.06	0.06	1.70	0.60
<i>Troctopsocopsis martinicus</i> , n.sp., ♂							
Sample size	13	13	13	13	13	13	13
Minimum	1.38	0.48	0.20	0.04	0.05	1.31	0.57
Maximum	1.47	0.54	0.22	0.06	0.06	1.46	0.68
Mean	1.42	0.52	0.21	0.05	0.06	1.39	0.62
S.D.	0.027	0.016	0.004	0.005	0.003	0.041	0.031
<i>Troctopsocopsis martinicus</i> , n.sp., ♀							
Sample size	11	11	11	11	11	11	11
Minimum	1.33	0.47	0.19	0.05	0.05	1.36	0.57
Maximum	1.47	0.50	0.20	0.06	0.06	1.54	0.67
Mean	1.39	0.48	0.19	0.05	0.05	1.44	0.62
S.D.	0.040	0.011	0.005	0.003	0.004	0.049	0.026

Table I. Measurements (in mm.) and Ratios of Electrentomoid psocids.

	Forewing length	Posterior tib. length	Posterior t <sub>1</sub> length	Posterior t <sub>2</sub> length	Posterior t <sub>3</sub> length	$\frac{IO}{D}$	PO
<i>Troctopsocopsis intermedius</i> , n.sp., ♂							
Two specimens	1.40 1.38	0.51 0.50	0.22 0.21	0.06 0.06	0.07 0.06	1.41 1.34	0.59 0.50
<i>Troctopsocopsis intermedius</i> , n.sp., ♀							
Two specimens	1.35 1.33	0.49 0.50	0.21 0.20	0.06 0.06	0.06 0.06	1.50 1.54	0.63 0.62
<i>Troctopsocopsis luciensis</i> , n.sp., ♂							
Sample size	9	9	9	9	9	9	9
Minimum	1.44	0.51	0.20	0.05	0.04	1.23	0.60
Maximum	1.79	0.56	0.23	0.06	0.06	1.43	0.66
Mean	1.49	0.54	0.21	0.06	0.06	1.37	0.63
S.D.	0.027	0.017	0.008	0.005	0.007	0.058	0.022
<i>Troctopsocopsis luciensis</i> , n.sp., ♀							
Sample size	10	10	10	10	10	9	9
Minimum	1.44	0.52	0.20	0.05	0.05	1.34	0.59
Maximum	1.53	0.53	0.22	0.07	0.06	1.49	0.68
Mean	1.48	0.53	0.21	0.06	0.06	1.43	0.64
S.D.	0.031	0.005	0.005	0.006	0.005	0.043	0.034
<i>Troctopsocus separatus</i> (Roesler), ♂							
One specimen	1.55	0.57	0.21	0.05	0.06	1.26	0.67
<i>Troctopsocus separatus</i> (Roesler), ♀							
Three specimens	1.55 1.49 1.58	0.57 0.56 0.54	0.21 0.20 0.20	0.05 0.06 0.06	0.07 0.06 0.07	— 1.39 1.52	— 0.57 0.57
<i>Troctopsocus similis</i> , n.sp., ♀							
Two specimens	1.84 1.78	0.65 0.65	0.24 0.22	0.06 0.06	0.07 0.07	1.50 1.50	0.65 0.65
<i>Troctopsocus bicolor</i> , n.sp., ♂							
One specimen	1.55	0.57	0.21	0.05	0.06	1.26	0.67
<i>Troctopsocus bicolor</i> , n.sp., ♀							
Sample size	4	4	4	4	4	4	4
Minimum	1.89	0.62	0.23	0.06	0.07	1.41	0.52
Maximum	1.93	0.64	0.26	0.07	0.07	1.62	0.67
Mean	1.92	0.63	0.25	0.06	0.07	1.48	0.59
S.D.	0.019	0.010	0.015	0.005	0.002	0.093	0.060

Table I. Measurements (in mm.) and Ratios of *Electrentomoid* psocids.

	Forewing length	Posterior tib. length	Posterior t <sub>1</sub> length	Posterior t <sub>2</sub> length	Posterior t <sub>3</sub> length	$\frac{IO}{D}$	PO
<i>Epitroctes tuxtlarum</i> , n.sp., ♂							
Three specimens	3.42	1.22	0.81	0.13	0.15	0.71	0.62
	3.33	1.16	0.76	0.13	0.16	0.78	0.56
	3.33	1.19	0.80	0.14	0.15	0.75	0.62
<i>Epitroctes tuxtlarum</i> , n.sp., ♀							
One specimen	0.47	0.97	0.68	0.14	0.16	0.77	0.60
<i>Compsocus elegans</i> Banks, ♂							
One specimen	2.22	—	—	—	—	1.02	0.72
<i>Compsocus elegans</i> Banks, ♀							
Two specimens	2.42	0.85	0.52	0.10	0.10	1.08	0.42
	2.53	0.86	0.54	0.10	0.09	1.11	0.46
<i>Electrentomopsis variegatus</i> , n.sp., ♂							
Sample size	6	6	6	6	6	6	6
Minimum	2.91	0.92	0.86	0.09	0.12	0.78	0.62
Maximum	3.13	1.01	0.92	0.11	0.13	0.87	0.67
Mean	3.06	0.97	0.88	0.10	0.12	0.83	0.65
S.D.	0.078	0.031	0.024	0.007	0.005	0.041	0.021
<i>Electrentomopsis variegatus</i> , n. sp., ♀							
Three specimens	2.97	0.97	0.86	0.10	0.12	0.89	0.66
	2.89	0.95	0.84	0.11	0.13	0.84	0.62
	2.91	0.97	0.86	0.12	0.13	0.87	0.65